RAILROAD GAZETTE

FRIDAY, SEPTEMBER 3, 1897.

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Contributions.

Rapalje & Mack's Railroad Law.

NORTHPORT, N. Y., Aug. 27, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your kind and flattering review of Volume VII. of Rapalje & Mack's Digest, in your issue of Aug. 27, was read with pleasure. While I feel greatly obligated for this mention in your paper, I feel it necessary to correct the impression in your mind as to the meagerness of the digest with reference to "strikes." You say that "this topic should have been more thoroughly worked up, in view of the Chicago platform and the great public interest in the subject at the present time." By referring to Volume I. of the Digest you will see that the report of cases digested does not include the date of the Chicago platform, and for some time prior thereto. This immense work had to stop somewhere, and the cases after about July 18, 1894, do not appear therein. You readily see that this is no fault of the work; rather it shows an opening for the necessity of a supplement in the future, in which recent and new matter relating to railroad law can be digested. WILLIAM MACK.

The Best Time to Go to the Klondyke.

NEW YORK, Aug. 31, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am quite in accord with Mr. Schenck's suggestion in your issue of Aug. 20, in regard to transportation to the Klondyke region in Alaska. Where no suitable roads or trails exist, winter is considered the most feasible time for traveling in the northern part of British Columbia.

When my brother, Franklin L. Pope, made his trip from Lake Tatla to the Stickeen River, the month of February was selected for the reason that swamps are then frozen, underbrush and fallen timber covered with snow, while the snow itself is firmly packed, and is in a most favorable condidion for snowshoeing and sledging. No dependence can be placed upon the resources of the country for a food supply; therefore no more precaution need be taken in that respect. Until posts are established, food must always be carried. A little consideration will also show that any project of building a steam railroad is premature. The Cariboo mines in British Columbia have been in operation for over 30 years, but there is no railroad within 200 miles of them. The value of gold is such that it will stand the highest cost of carriage, while the transportation of the limited number of people going in, as well as their food supply after locating, is comparatively a small matter, even with the crude methods of transportation that will be available next season. Nothing equals a gold discovery for opening up a country. Scattering miners have been going into Alaska for many years, but the facilities for transportation and available subsistence are not nor cannot immediately be made equal to the accommodation of the sudden influx of prospectors. Another season will see a great change in this respect, and with an ample food supply no more danger need be apprehended than in any other country. R. W. POPE.

Electric Roads and the Brooklyn Bridge.

We stated last week that the contracts had been signed between the Brooklyn elevated and street railroad officers and the bridge trustees whereby street and elevated road cars will be run through to and from the New York terminal station of the bridge. The street railroads were to begin work on the necessary change of structures within 10 days after the contract was signed, and so far everything has progressed favorably. George H. Thomson & Co., of 51 East Forty-fourth street, New York, have the contract for the entire work, amounting to from $250,000 to $300,000 for the necessary changes to be made by the street roads.

As mentioned in our issue of Aug. 13, the plans provide for building a deck at the New York end for the electric cars above the present platform. There will be four loops on this second or street car platform, each providing loading space for two cars. This platform will be reached by 12 elevators, some of which will run to the street, while others will stop at the first gallery deck, on a level with the station of the Third avenue elevated. The contract for these elevators has been sublet to the Sprague Electric Elevator Co., and that for the structural iron work to the Pennsylvania Steel Works. The entire cost of changes which are to be made must be met by the combined electric roads that have entered into the contract with the bridge trustees.

Elective Studies in the Regular Engineering and Technical Courses.*

Modern civilization, with its wide range of material requirements, has forced upon mankind an equally wide range of occupations. The field of labor, so far as the individual is concerned, is becoming more and more specialized. This is particularly true of technical occupations in general, and civil engineering, mining engineering and mechanical engineering show a marked and increasing tendency to subdivide into new and special lines of work.

Most of the older technical colleges, both here and abroad, have recognized this tendency, and have multiplied the number of their courses in order to train men for many special lines of work. Some of our leading educators have thought it necessary to protest that we have already too many courses of instruction. They would confine the work of the engineering colleges to a limited number of courses and postpone specialization to the after years of professional life. No one, however, will go so far as to recommend but a single course of instruction for all engineers, and it will be generally admitted that several courses—that some degree of specialized instruction is necessary. Two questions, then, rise for discussion:

(1.) How far shall special instruction be carried in the engineering colleges, and how much shall be left to be obtained in professional practice after graduation?

(2.) What is the best method of organizing the instruction to secure the amount of specialization desirable?

The following conditions tend to limit the possibility and the extent of specialization in the engineering colleges.

The education given must be complete and thorough in all fundamental and necessary subjects, and it must also have breadth and include a sufficiently wide range of subjects.

If through the lack of proper preparatory schools it is necessary to make good the deficiencies of the students in elementary subjects, it is evident that one or both of the above requirements must be sacrificed if specialization is attempted to any great extent.

In addition to these educational requirements there are further limitations of a practical or economic character. Instruction in any new subject, or special instruction in a subject already given, demands extra work on the part of some member of the faculty, perhaps already overburdened, or more often an addition to the teaching force. It is, therefore, impracticable to go far in the direction of specialization with a small faculty.

Again, a new course of study usually requires laboratories, collections and other apparatus of instruction and rooms, or even a new building, to accommodate these additions.

Finally, it is impracticable to add to the teaching force or the equipment of a school for the sake of a very few students.

Having in view these limitations, educational and economic, it is evident that a large number of courses, or great specialization in technical instruction, can be offered only by an institution with a large faculty well equipped, and with large numbers of well-prepared students to draw upon.

These limitations being admitted, the following advantages may be claimed for highly specialized instruction, or for the institution offering a large number of courses of study. The education which best fits a man for his future career will be most profitable to him. If we know just what the future life work of a student is to be, it will be possible to advise a scheme of study, which, without sacrificing breadth or thoroughness, will best fit him for that work. If, for example, a young man desires to make a specialty of electro-metallurgy, he should not be called upon to choose between the course in mining engineering and the course in electrical engineering, nor should he be compelled to take the course in mechanical engineering; but, if possible, he should be allowed a combination of the three courses, and the scheme of instruction should be sufficiently elastic to permit this and other similar combinations.

An institution which offers the special education needed by any given class of students will naturally attract that class, and the institution tendering the greatest range of courses of study, other things being equal, will prove useful to the greatest number of students, and of greatest value to the community.

The full efficiency and usefulness of a large faculty, and of each member of that faculty, can be secured only by highly specialized instruction. With a few rigid courses only, the number of subjects that can be offered by any professor is necessarily limited to those included in these courses. With the widest possible range of choice offered to students, either under the electric system, or by many courses, the number of subjects that may be offered by any professor is limited only by his capacity for useful work. In each department long courses may be provided for students requiring a thorough knowledge of the subject, and short courses for students to whom the subject is of minor importance, as well as advanced courses for those desiring to make the subject a specialty.

The possibility of those offering long and short courses is of great advantage to the institution. When a single course of lectures only is given in any subject, it is difficult or impossible to adapt the instruction perfectly to the wants of the different classes of students. A course in metallurgy, for example, designed for the needs of a mining engineer, will be much too long and detailed for the student of civil engineering, and only imperfectly adapted to the needs of the student of chemistry or of mechanical or electrical engineering.

The introduction of new courses of study often tends to improve and strengthen existing courses in another way. For example, courses in civil engineering and in mining engineering should include some instruction in mechanical engineering. The establishment of a course for the degree of mechanical engineer in the same institution, with mechanical laboratories and shops, makes it possible to give this instruction to the civil and mining engineering students under most favorable conditions. The addition of a course in electrical engineering will, in a similar way, tend to strengthen all the other courses in engineering.

The adoption of a high degree of specialization thus offers to each student exactly the education best fitted to his needs, adds to the usefulness of the faculty, and tends to promote the growth and development of the institution both from the educational standpoint and on the material side as well.

A modern university offers as much work as can be compassed in a life time, from which the individual student may choose the four or six years' work adapted to his temperament and needs. Why should not the technical schools aim at like development?

We may proceed now to the second questions—how may the instruction best be organized to secure the high degree of specialized instruction which seems to be desirable? The student's course of study is determined by three plans of study: (1) the elective system; (2) the course system; or (3) by the combined course and elective system.

The elective system for special students has been in use at most of our technical institutions and has had a more or less complete trial side by side with the second plan. As a result of long experience these special students have been shut out from some institutions, and are admitted to others only in limited numbers, and with their freedom of choice much restricted.

The main objection to the elective system in engineering education is that the final decision as to the necessary preparation for his life work rests with the student himself. In rare cases he may evolve a scheme of instruction better than that which could be devised for him by the combined wisdom and experience of his instructors. So far as he avails himself of the advice of his elders, and so far as he is controlled by carefully framed and wise regulations, he may escape serious mistakes. He may be prevented from taking subjects for which he is not properly prepared by insisting upon the proper sequence of studies.

A certain degree of breadth may be secured by insisting upon a proper association or grouping of studies. Unwise or undesirable combinations may be prevented by special rules, or by a prearranged conflict of lecture hours. This process may even make the choice so limited and so carefully guarded that the student cannot make a mistake, and must take a course of study perfectly satisfactory to his instructors. When this result is reached the system is no long elective, but is the course system more or less disguised.

The administration of the course system with elective studies should be much simpler than for the elective plan. In a large institution under the latter the advisory officers may be required to pass upon a thousand courses of study for as many students in the first week or two of the term. Those who have spent anxious years in perfecting a single course of study in civil engineering, in mining engineering or in mechanical engineering are able to realize what this means. The work must be done by a small committee, as the energy and executive ability required to do it properly are not common. The task is well-nigh impossible and mistakes must be many and serious. The executive officers are called upon to pass judgment in each case on a single year's studies—a detached fragment of the student's course of study only. It is probable that the best and most successful advisory officers consciously or unconsciously adopt a course system and formulate each in his own line a course or a series of courses of study which, with slight modifications, the students are compelled to take by suitable regulations and by the exercise of tact and hypnotic influence if necessary.

The administration of the course system is much

*Abstract of paper by Henry S. Munroe, Professor of Mining, Columbia University, New York, presented at the Toronto meeting of the Society for the Promotion of Engineering Education.

simpler and more likely to be successful. A series of courses, 10, 20 or 30, with variations, if necessary, are worked out to take full advantage of the resources of the institution. This is the work of years. It is, then, a comparatively simple matter to select the course best adapted to the individual student's needs, and to consider any minor changes and substitutions that may seem advisable.

The combined course and elective system has been in use for many years at several institutions, and, if developed to its full extent, would seem to have all the advantages of the elective plan in permitting almost indefinite specialization, while securing at the same time the breadth, completeness and thoroughness of carefully planned courses of study. In some institutions, as at the University of Michigan, the required studies of a course are arranged to occupy a certain proportion of the student's time, and he is free, under proper regulations, to take such subjects as he may elect to make up the balance of the hours required for his degree.

In other institutions, as at the Massachusetts Institute of Technology and at Columbia in its technical schools, the courses are planned to occupy the whole time of the student, but certain studies may at will be replaced by certain other specified subjects. The second plan may be developed so as to permit as great variation in the regular course of study as the first; the initiative is taken by the faculty and not by the student.

Either of these plans is a great improvement on this rigid course system in permitting specialization in desirable directions, and either plan avoids the disadvantages of the elective system, though necessarily imposing a somewhat greater restriction on the liberty of choice of the student. The second plan, if desired, can be so modified as to permit the student to suggest substitution of one study for another, or even new combinations of courses to suit his particular needs.

In an institution offering many courses of study, one of the most difficult problems is the arrangement of a scheme of hours for lectures, recitations and laboratory work. In the elective system a poorly devised scheme may limit seriously the student's choice of studies, and may force him to undesirable combinations in order to occupy his time.

A great advantage of the course system is that each combination of studies and each class of students must be provided for in the scheme, and thus every student is able to pursue his studies in proper sequence and to the best advantage.

In the elective system it is manifestly impossible to provide for every individual student, or to arrange for all possible combinations of studies, and this fact in many cases deters the officers in charge from giving that careful attention to the details of the scheme that is desirable for the best results.

In the course system, the proper arrangement of the scheme of hours is a necessity and is accomplished at any cost, and elective or alternative studies are put naturally in the same hours as the studies they are to replace, and a scheme of hours is thus built up which permits the student to take full advantage of the opportunities offered.

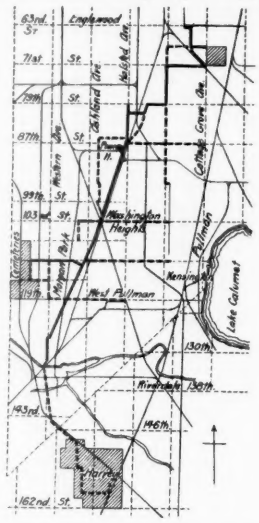
In the *Discussion*, attention was called to the fact that a large number of engineering graduates drift into other lines than pure engineering, and the opinion was expressed that industrial pursuits formed a desirable field for them. It was thought that engineering tends to cultivate executive ability, so that engineers will in future be more often called to become heads of large concerns, as already in railroads and manufacturing to some extent. Attention was called to the fact that with any one of many optional studies, it is easy to secure the substantial training necessary for an engineering education.

Englewood & Chicago Storage Battery Road.*

The progress of the construction of the storage battery road in the city of Chicago has been watched with considerable interest. Associated with this enterprise are engineers of high standing, and the complete manner in which everything has been done at the power station and in the car equipment will make the tests of this line of much value in determining the advantages and disadvantages of a road worked by storage batteries of modern construction. Compared with this plant, former ones which were used exclusively to work street cars seem crude. From time to time we have noted in our columns the progress of this road, and now that more than 20 cars are in regular service, it may be well to give briefly some of the more important features of this enterprise. For this information we are largely indebted to Mr. G. A. Damon's recent article in the *Western Electrican*.

In 1895 the company secured valuable franchises between Woodlawn and Harvey, covering in all about 35 miles of streets, and active preparations were immediately begun for the construction of the road. The accompanying map shows by the continuous black line the portion of the road at present in operation, while the heavy dotted lines show the proposed extensions.

The power-house was completed last spring, and on June 20, 10 cars were placed in regular service, and this number has been increased so that now the rolling stock includes 16 open and eight closed cars, 16 trailers, besides two 3,500-gal. sprinklers and a snowplow. The cars, which are mounted on Dupont trucks, resemble somewhat those in common use, but in the construction of the trucks a radical difference will be found to exist. This is made necessary by the method adopted for handling the batteries, which are supported upon the trucks beneath the car and between the axles To leave this space free for the battery trays, the 50 H. P. Walker motors, with which each truck is supplied, is suspended on the outside of the car axle. Each battery tray is supported on two



Route of Englewood & Chicago Electric Storage Battery Road.

bars running across the frame and and engaging hooks formed by ⅜-in. channels under the tray.

The method of handling the battery trays present the most unique features of the entire installation and the problem has been so well thought out that but 1½ minutes are required to make a change. The entire work of changing the cells is done by one man, the operation being as follows: The car rounds up into the station from either direction, stopping under the arcade over the pit at the end of the charging-room. The elevator which is raised to take the exhausted battery from the car is part of a traveling carriage, which runs along the track, extending through the center of the charging room in the basement. This carriage is provided with an elevator at each end, while the middle is taken up with a platform for the attend ant, on which he controls operations. One battery from the car is released by pulling a lever and on lowering the elevator, the entire carriage is advanced a few feet, bringing tht charging battery directly under the car truck, to which it can be readily elevated. After the charged batteries have been placed on the trucks, the exhausted or discharged battery which has just been removed from the car is conveyed by the carriage to an empty charging table.

The entire weight of the tray of batteries on the car is about four tons, there being 72 cells arranged in 12 rows of six each. When in series, the batteries will deliver a current of 400 amperes at about 145 volts. These were especially designed for the Chicago road by the Storage Battery Co., of Philadelphia, and some of the cars and batteries were given a preliminary test on the Madison avenue line in New York before being used in Chicago.

The engineers have adopted a novel method of storing the cells. One difficulty which arises in this connection is due to an increase of electric motive force as the battery becomes charged. To overcome this difficulty, three dynamos, each having a different voltage, are arranged so that by connections with the switchboard the discharged battery can be first subjected to a potential of 160 volts, and when the current becomes less than, say, 35 amperes, a connection is made by which the charging potential is 172 volts, and finally when the charging current reaches 150 amperes and similarly decreases, connection is made to the highest potential of 176 volts. The engines and dynamos are connected so that center engine can operate any one or all the four generators while either of the smaller engines at the ends of the shaft can run either one or both of the adjacent generators. At the present time, the large central engine is not installed.

Some idea of the care with which the details have been worked out and executed may be obtained when it is stated that the cost of the entire power plant, capable o delivering 1,000 mechanical horse power, will not be over $86 per horse-power. This figure is very low considering the high grade of machinery and the excellent quality of material used in building the plant. Mr. Damon believes that it should produce a horse-power on less than 2 lbs. of coal. The entire working force in the power-house consists of a fireman, an engineer and a man to handle the batteries. The men work in shifts of eight hours each.

Especial attention has been given to the track construction, with the result that it is said to compare favorably with the highest class of steam railroad practice. Eighty-lb. 7-in. Johnson girder rails are used throughout. The track, of course, is not bonded.

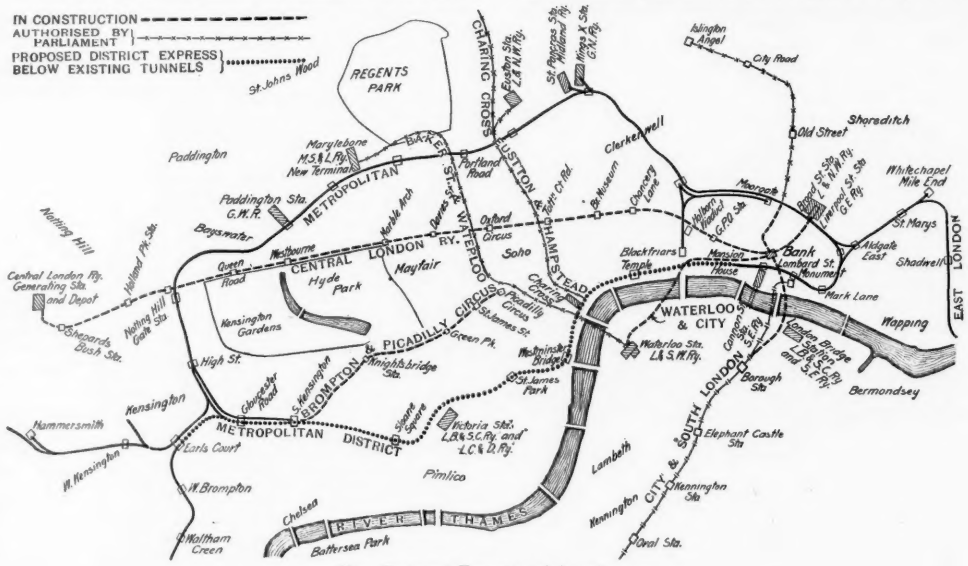
No matter what the final outcome of the trials may show, great credit is due to Mr. G. H. Condict and the engineers associated with him for the very excellent engineering work already done.

The Tunnel Railroads of London.

The sketch map herewith shows the deep tunnels and the existing underground railroads in London, together with locations of those now building. It is surprising to see the magnitude of the enterprises now in hand. The solid lines show the Metropolitan and Metropolitan District lines, which, as everybody knows, have been working for years and are in open cuttings or shallow tunnels. It will be observed that a portion of the Metropolitan District line is shown in dotted lines, which is described in the legend as proposed district express tunnels below the existing tunnels. It will be understood that the line so represented is a part of the old system of the Metropolitan District, but it is proposed (and this is Sir Benjamin Baker's project) to dip down below the Metropolitan District to a considerable depth and run to the Mansion House or thereabouts with a deep tunnel, which shall be devoted to express trains only. By this plan additional tracks can be secured for express trains, while avoiding all complications with regard to right of way. Doubtless a considerable expense can also be saved in ground for terminals and stations. This scheme was described in the *Railroad Gazette* several months ago.

The Central London tunnel railroad, from Shepherd's Bush to the Bank of England, and to the stations of the North London and the Great Eastern, is now building. This also has been described more than once in the *Railroad Gazette*. The Waterloo & City tunnel, from the Waterloo station of the London & South-Western to the Bank, is completed, and was opened with great ceremonies some weeks ago.

Of course the reader will know that the City & South



The Railroad Tunnels of London.

London, which is shown as running southward from near the Bank, is the electric railroad in the famous Greathead tunnel, concerning which so much has been written in the last five years. Concerning the proposed northerly extension of that line to Islington we know nothing. Of another north and south project shown, as authorized by Parliament, from Charing Cross past the Euston station of the London & North-Western, we have no definite information; that is, we can say nothing as to the immediate present status of the project, which is true also of the Baker Street & Waterloo project. These, especially the line from Charing Cross to Euston, ought to be very profitable lines, as they cross the great lines of traffic and lie in a region of dense population and great activity. The chief

*It was intended that this article should appear simultaneously with the editorial on "Cost of Motive Power" published last week.

purpose of the Baker Street project is, doubtless, to give the new extension of the Manchester, Sheffield & Lincolnshire Railway into London an opportunity to put its passengers into the heart of the town.

For the blue-print from which the engraving is made, we are indebted to Mr. Baldwin, President of the Long Island, it being a copy of a plan procured or prepared for him by Mr. Jacobs. It is a matter of common knowledge that these gentlemen are intensely interested now in the study of enterprises of this kind; in fact, both of them have gone to London for that purpose.

Train Accidents in the United States in July.

COLLISIONS.

REAR.

1st, on Burlington & Missouri River, at Akron, Col., a passenger train ran into the rear of a preceding freight train, doing slight damage. The engineman, fireman and one passenger were injured.

9th, 1 a. m., on New York, New Haven & Hartford, at Saundersville, Mass., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking one car. A brakeman was injured.

9th, on Erie road, at Warren, Pa., passenger train No. 21 ran into the rear of a preceding freight train, badly damaging 4 freight cars. The express messenger was injured. It is said that the collision could have been prevented but for the failure of the sanding apparatus of the engine of the passenger train.

10th, on Pittsburgh, Bessemer & Lake Erie, at Greenville, Pa., a freight train ran into the rear of a preceding freight, badly damaging 15 cars and overturning the engine. The engineman was injured.

14th, 1 a. m., on New York & Greenwood Lake, near Upper Montclair, N. J., a freight train ran into the rear of a preceding freight, damaging the engine and caboose. The caboose caught fire and, with 2 platform cars, was destroyed. A brakeman was badly burned.

17th, on Delaware & Hudson, near Whitehall, N. Y., a passenger train ran into the rear of preceding freight, damaging several cars. The fireman and several passengers were injured.

29th, on Norfolk & Western, near Ingham, Va., a freight train broke in two and the rear portion afterward ran into the forward one, wrecking 6 cars. One man was killed and 2 injured.

And 12 others on 8 roads involving 2 passsenger and 17 freight trains.

BUTTING.

1st, on New York Central & Hudson River, at Buffalo, N. Y., butting collision between freight trains, both moving backward, badly damaging several cars. A brakeman was injured. There was a dense fog at the time.

2d, 4 a. m., on Pennsylvania road, near 33d street, Philadelphia, butting collision of freight trains, due to disregard of signals by one of the trains. Both engines and four cars were badly damaged, one of the engines being overturned; one fireman was killed.

5th, 1 a. m., on Union Pacific, Denver & Gulf, near Manitou Junction, Col., butting collison between a northbound freight train and a southbound train of empty passenger cars, damaging both engines. One engineman was injured.

7th, on Pennsylvania road, at Vandergrift, Pa., a passenger train ran over a misplaced switch and into the head of a freight train, damaging both engines. One trainman was injured.

13th, 3 a. m., on Chicago, Milwaukee & St. Paul, at Iron Mountain, Mich., a switching freight train collided with some cars which had escaped from a sidetrack and run out upon the main line, making a bad wreck. A brakeman was injured.

13th, on Chicago & Northwestern, near Boone, Ia., 4 cars escaped from a switching freight train and ran out upon the main track uncontrolled. They ran some distance down grade and collided with a freight train moving in the opposite direction, damaging the engine and 4 cars. A tramp was killed.

16th, on Atchison, Topeka & Santa Fe, near Edgerton, Kan., butting collision between eastbound freight No. 28 and westbound freight No. 65 wrecking both engines and 17 cars. A tramp was killed and 5 trainmen and one tramp were injured.

CROSSING AND MISCELLANEOUS.

2d, on Lake Erie & Western, at Reservoir, O., a passenger train, approaching a meeting point at uncontrollable speed, collided with some freight cars standing on the sidetrack, damaging the engine and two cars. Six passengers were injured.

2d, near Celeste, Tex., a northbound passenger train of the Missouri, Kansas & Texas was run into by a southbound freight train of the Atchison, Topeka & Santa Fe, at the crossing of the two roads. Two passenger cars were badly damaged; six passengers injured. It is said that the passenger train failed to stop before entering upon the crossing.

9th, on Cleveland & Pittsburgh, at East Liverpool, O., a freight train ran over a misplaced switch and collided with another freight, damaging 20 cars. A brakeman was badly injured.

9th, on West Jersey & Seashore, near Haddonfield, N. J., a passenger train ran over a misplaced switch and into some freight cars standing on the sidetrack, damaging one car. The engineman was injured.

28th, on Northern Pacific, at Kalama, Wash., in the making up of passenger train the forward part was backed violently against the rear portion, doing considerable damage and injuring 2 passengers.

30th, on Lehigh Valley, at Depew Junction, N. Y., collision of freight trains at a junction, making a bad wreck. One engineman and one fireman were killed.

30th, on Erie road, at Salamanca, N. Y., collision between a switching freight train and passenger train No. 8, wrecking several freight cars. The engineman was injured.

And 14 others on 14 roads involving 5 passenger trains and 17 freight.

DERAILMENTS.

DEFECTS OF ROAD.

8th, on Northern Pacific, near Butler, Mont., a freight train was derailed and the engineman and fireman were injured. The engine was overturned and, with 7 cars, fell down a bank. The whole of the train, 37 cars in all, went off the track. The engine was a new and very heavy one, and, according to the reports, the derailment was due to the spreading of rails.

15th, on New England road, near Elmwood, Conn., a freight train was derailed while running through a temporary crossover track. The wreck made a connection between the track and the electric rail (provided for the Hartford-New Britain cars) and withdrew the power from the cars.

17th, on Cincinnati, Hamilton & Dayton, near Chillicothe, O., a freight train broke through a trestle bridge which had been weakened by a freshet and 12 cars were wrecked. The engineman, fireman and one brakeman were injured.

23d, on Pittsburgh & Western, near Fombell, Pa., a milk train broke through a bridge which had been weakened by a flood and several cars were wrecked. The fireman was fatally injured.

25th, 10 p. m., on Zanesville & Ohio River road, near Marietta, O., a passenger train broke through a trestle bridge, and 2 passenger cars fell to a cornfield below, the trestle being partly filled in and the cars rolling down at one side. Fifteen passengers were injured, none fatally. One of the cars took fire and several passengers narrowly escaped the flames.

28th, on Cleveland, Cincinnati, Chicago & St. Louis, near Berea, O., the engine of a wrecking train broke through a bridge, on a branch track leading to a quarry, and fell to the stream below. The engineman was killed and the conductor and fireman injured.

And 3 others involving 3 passenger trains.

DEFECTS OF EQUIPMENT.

7th, on Pennsylvania road, near Downingtown, Pa., a freight train was derailed by a broken wheel and 22 cars were badly damaged. A brakemen was injured.

7th, on Pittsburgh & Lake Erie, at Fallston, Pa., a freight train was derailed by a broken wheel and 9 cars fell down a bank into the Beaver River. One tramp was killed and 2 injured.

8th, on Philadelphia & Reading, near Sellersville, Pa., the engine of a freight train was badly damaged by the breaking of a driving wheel axle, the broken side rod destroying a part of the cab and making a hole in the boiler. The fireman was badly scalded.

And 17 others on 13 roads involving 2 passenger trains and 15 freights.

NEGLIGENCE IN OPERATING.

2d, 11 p. m., on Atchison, Topeka & Santa Fe, near Clemow, N. Mex., a stock train became uncontrollable on a steep grade, and the entire train, consisting of an engine and 11 cars, was derailed, most of the cars being wrecked and the cattle killed. The trainmen took refuge in the caboose and cut it loose from the train. It is said that the engineman lost control of the air-brakes.

5th, on Great Northern, at Kalispell, Mont., a passenger train was derailed at a misplaced switch. A tramp was injured.

7th, on West Jersey & Sea Shore, at Somers Point, N. J., 2 cars which escaped from a switching freight train ran down grade and off the end of the track at a wharf. A pavilion on the wharf was wrecked and a man nearby was badly injured.

25th, on Erie & Pittsburgh, near Shenango, Pa., a freight train was derailed at a derailing switch approaching the crossing of the Erie road, and the engine and 5 cars were overturned. The switch had been opened by the signalman on account of the rapid approach of a train on the other road which he feared would be unable to stop before reaching the crossing.

And 6 others on 6 roads, involving 1 passenger train and 5 freights.

UNFORESEEN OBSTRUCTIONS.

6th, 1 a. m., on Louisville & Nashville, near Richmond, Ky., a passenger train was derailed by a washout and the engineman and fireman were injured.

6th, 3 a.m., on Boston & Maine, near Woodsville, N. H., a freight train was derailed at a washout, and the engine and 3 cars wrecked. The engineman, fireman and 1 brakeman were killed.

6th, on Great Northern, near St. Cloud, Minn., a freight train was derailed at a washout, and the engine and 20 cars were ditched. One man was killed and another injured.

7th, on Chicago, Milwaukee & St. Paul, near Faribault, Minn., a freight train was derailed at a washout and 2 trainmen were killed.

10th, 4 p. m., on Delaware, Lackawanna & Western, at Syracuse, N. Y., a car in a freight train moving slowly across Salina street was knocked off the track by a street car which approached the crossing at uncontrollable speed and ran against the train. The street car rebounded, and the power not having been shut off, struck the train a second time, and overturned another freight car. Two passengers in the street car were injured.

15th, on Mount Washington Railroad, at Mount Washington, N. H., a locomotive and 2 cars, left unattended, were started down the mountain by a furious wind and at the first curve were overturned and wrecked.

16th, 1 a. m., on Louisville & Nashville, at Harris, Ky., a passenger train was derailed at a washout and the engineman and fireman were injured.

18th, on Rio Grande Western, near Green River, Utah, a passenger train was derailed by a sand drift and the engine was overturned. The roadmaster, riding on the engine, was buried in the sand and the engineman was scalded, both being fatally injured.

22d, on Charleston & Western Carolina, near Augusta, Ga., a passenger train was derailed by a piece of iron lying on the track, and the engine and first 2 cars were ditched. The fireman and an air-brake instructor riding on the engine were injured.

23d, on Nashville, Chattanooga & St. Louis, near Fayetteville, Tenn., an engine was derailed by running into a handcar, and the engineman was injured.

24th, on Western New York & Pennsylvania, near Sherman, N. Y., several cars of a freight train were derailed by running over the body of a brakeman who fell from the top of one of the cars.

29th, on Long Island road, at Northport, N. Y., a passenger train was derailed at a washout and 5 passengers and 2 trainmen were injured.

30th, 2 a. m., on Cleveland, Cincinnati, Chicago & St. Louis, at Thornton, Ind., passenger train No. 34 was derailed at a switch, while running at good speed, and the engine and tender were overturned The engineman and fireman were killed and 2 tramps were injured. It is said that the derailment was due to a coupling pin which had been maliciously wedged between the rails at a switch.

And 2 others involving 2 freight trains.

UNEXPLAINED.

3d, on Boston & Maine, at the drawbridge near the terminal station in Boston, a westbound passenger train of the Fitchburg road was derailed, and one of the cars, striking against a cable supporting the drawbridge, was overturned. It was well filled with passengers, but no one was seriously injured. The train was running at a very low speed.

13th, on St Louis & San Francisco, near Joplin, Mo., the engine of a passenger train, which was running tender first, was derailed and overturned. The engineman and fireman were injured.

14th, on Pennsylvania Road, at Harrisburgh, Pa., a passenger train was derailed at a frog in the trainshed and the engine was overturned. The fireman was injured and a boy, the son of the engineman, was killed.

14th, on Mobile & Ohio, at Fireburg, Ala., a passenger train was derailed and the engineman and fireman were injured.

14th, on Baltimore & Ohio, at Chester, Pa., the engine of a freight train wat derailed and fell partly into a creek. The conductor was pushed into the water and came near being drowned. The conductor and 3 other trainmen were injured.

17th, on Fitchburg road, at Keene, N. H., a freight train was derailed and 2 engines and 6 cars were wrecked. Two enginemen and 1 fireman were injured.

19th, on Atchison, Topeka & Santa Fe, near Talpa, Tex., a freight train was derailed and a man in charge of cattle was injured.

20th, 2 a. m., on Southern Pacific, at Sheridan, Cal., a passenger train entering a sidetrack was derailed and a sleeping car overturned. Two passengers were injured.

20th, on Philadelphia, Wilmington & Baltimore, at Wilmington, Del., a car in a freight train moving on a sidetrack was derailed and fell against a passenger train which was passing at the time, badly damaging one side of each of three passenger cars. Three passengers were cut by flying glass.

21st, on Cleveland, Akron & Columbus, at Silver Lake, O., 3 cars of an excursion train were derailed and 1 passenger was injured.

28th, on Southern Pacific, near Verdi, Nev., a westbound passenger train was derailed and the mail and baggage cars were wrecked. Two mail clerks, the fireman and several passengers were injured and 3 Indians riding on the platform of the baggage car were killed. One passenger car and 1 sleeping car were ditched and 2 other sleeping cars were badly damaged.

29th, on Missouri Pacific, near Toronto, Kan., a freight train was derailed and 10 cars were ditched. A brakeman was badly injured.

And 31 others on 26 roads involving 5 passeng er trains and 26 freights.

OTHER ACCIDENTS.

1st, on Chicago & Northern Pacific, near Blue Island, Ill., the locomotive of a passenger train was wrecked by the explosion of its boiler and the foremost passenger car was badly damaged. The engineman and fireman were badly injured and 3 passengers and an occupant of a house near the track were slightly hurt.

15th, on Cammal & Black Forest, near Cammal, Pa., the locomotive of a freight train was wrecked by the explosion of its boiler, and the engineman and fireman were fatally scalded. The newspaper reports state that the engineman had reported the crownsheet as unsafe two weeks before.

A summary will be found in another column.

New Box Cars for the Chesapeake & Ohio.

Specifications and drawings have recently been sent out for 1,000 box cars of 60,000 lbs. capacity for the Chesapeake & Ohio. The cars will have an inside length of 36 ft. and a width of 8 ft. 2¼ in., and they will have a height of 7 ft. 7¼ in. from the floor to the underside of carline. The length over end sills, which will be of clear oak 8×10 in. in size, will be 38 ft. 1½ in. The cars will have side sills of long-leaf yellow pine 5×9 in., framed to end sills with double tenons, and fastened to the end sill at each end with ¾-in strap bolts. The side sills will be gained for the bolsters, to which they will be fastened with ¾-in. bolts. The center sills, also of yellow pine, will be 5×9 in., and framed to end sills the same as the side sills. They will be gained for bolsters and beams and fastened to them by ¾-in. and ⅝-in. bolts respectively. There will also be 4 × 5-in. pieces bolted to the under side of center sills between bolsters. The intermediate sills will likewise be of long-leaf yellow pine 4 × 9 in., and will be framed to end sills with double tenons, the same as center sill.

The body bolsters will be made of wrought iron with a ⅜-in top plate and a 1-in. bottom plate each 8 in. wide. The plates will be shaped and drilled; and when put together, the spaces between them will be filled with oak wood. Cross-frame tie timbers and carlines will be of oak, the former 4 × 8 in. in dimensions and the latter 2 × 13 in. Draft timbers will be of clear white oak 6½ × 8⅛ in., gained for tie plates, anchor blocks and chafing irons, and fastened to under side of center sills and through end sills and tie plate with ⅞-in. bolts. The drawbar will be of an approved make, provided with an arrangement for coupling cars from the outside, and fitted with drawbar yokes of wrought iron 1 × 4 in., which will be riveted to the coupler by two 1⅛-in. rivets. The drawbar will also be fitted with the Butler drawbar attachment and Chesapeake & Ohio standard double coil springs, outside coil 6 in. in diameter, 8 in. long and made of ¾-in. diameter crucible steel and compressed ⅝ in. when put in position. The springs will be subject to the railroad's specifications for coil springs.

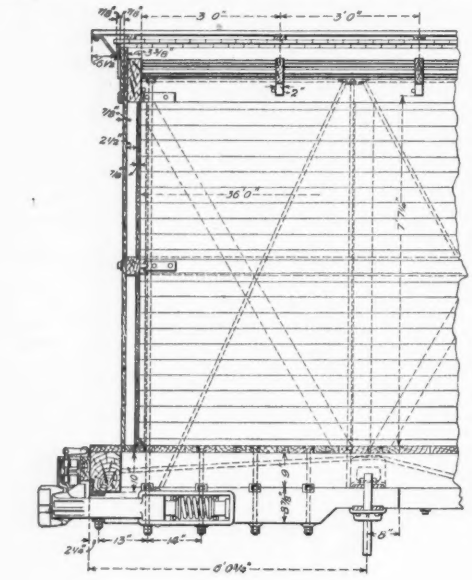
The inside lining of the cars will be of ⅞-in. oak. The boards will be tongued and grooved and planed on both sides, and must be not over 6 in. wide. The cars will be lined from floor to plates. The roof will consist of two courses of white pine boards ⅞ in. thick and not over 6 in. wide, with a plastic roofing material, of an approved make and guaranteed for the life of the car, laid between the courses. The side door openings will be 5 ft. 6 in. wide in the clear and full height between floor and plate. The doors will be hung from the top, and the style and make of fixtures will be subject to approval. The cars will be provided with grain doors of some approved make.

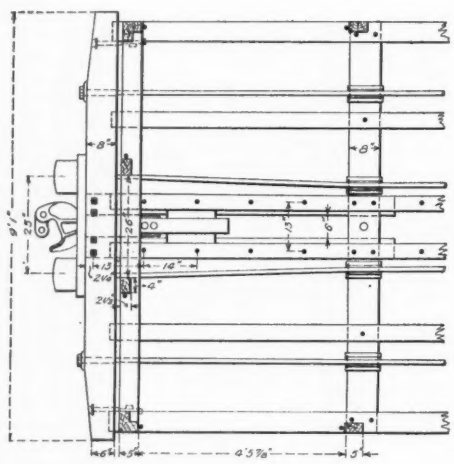
There will be four 1⅛-in. body truss rods on each car These will have a 1¼-in. upset at the ends for both the nuts and the turnbuckles. They are to have a tensile strength of 50,000 lbs. per square inch and are to be bent to shape in a former while hot. At the option of the inspector, these rods may be subject to individual tests. The body center plate will be either of malleable iron or pressed steel, fastened to the bolsters with the ¾-in. bolts which bolt the center sills and bolsters together.

The cars are to be equipped with the Westinghouse

freight air-brake, and brakes are to be applied to all the wheels of both trucks. The brakebeams will be hung from the truck bolster.

The trucks will be the standard for freight cars of 60,000 lbs. capacity, with M. C. B. standard axles, having 4¼ × 8-in. journals. The truck bolster will be of the compound type, made of three pieces of white oak, outside pieces to be 3⅜ × 10¼ in. and center piece to be 4⅜ × 10¼ in. Between the three oak timbers there will be two pieces of wrought iron ⅝ in. thick and 10¼ in. wide.





New Chesapeake & Ohio Box Cars.

The bolsters are to be bolted together with ¾-in. bolts, and when finished they will be 10½ in. deep × 13 in. wide × 7 ft. 5 in. long. They are to be gained on each end so as to leave 7½ in. depth of timber. The spring plank will be made of two pieces of angle iron 3 in. × 4 in. × ⅝ in. × 7 ft. 5 in. long, weighing 13.6 lbs. to the foot. The spring seat will be riveted to these by ⅝-in. rivets. The iron for the arch bars and the tie bars is to have a tensile strength of 50,000 lbs. per square inch. The top and bottom bars will be 1⅛ × 4 in , and the tie bars ¾ ×4 in. The trucks will be fitted with cast-iron wheels 33 in. in diameter. These are to be 5½ in. wide, and are to weigh not less than 590 nor more than 610 lbs. each, 600 lbs. being the standard. They are to be bored with two cuts, the last being not over 1/16 in., and are to be forced to place on wheel seat with a pressure of not less than 30 nor more than 40 tons.

For each 50 wheels that have passed inspection and are ready for shipment, one wheel will be selected by the company's inspector for test. The wheels are to withstand eight blows struck centrally upon the hub by a 140-lb. weight falling 12 ft. Besides the customary drop test, the wheels must also be able to withstand a heat test made by filling a channel-way 1½ in. wide and 4 in. deep, molded with green sand around the wheel, with molten cast iron, which must be hot enough when poured so that the annular band which is formed around the tread of the wheel when the metal is cold shall be solid and free from wrinkles or layers. The time when the pouring stops must be noted, and two minutes later an examination of the wheel must be made. If the wheel be found broken in pieces, or if any crack in the plate extend through the tread in either of the wheels tested, the 100 wheels represented by the tests will be rejected.

The axles are to be of the best machine scrap or open-hearth steel of an approved make. The journals are to be 4¼ × 8 in. The wheel fits will be 5⅝ in. × 7¼ in. long. The middle of the axle will be 4⅝ in. in diameter and the collar will be 5¼ in. in diameter by ⅝ in. The journal boxes will be the M. C. B. standard for 4¼ × 8-in. journals. They are to be made of malleable iron with the M. C. B. standard lid hinged on top, the lid to be of malleable iron or pressed steel.

In the design of these cars the M. C. B. standards have been invariably used except in the case of the buffer blocks, where the Chesapeake & Ohio's standard of 25 in. between centers has been maintained. By the use of malleable instead of common gray iron in a large number of parts, the weight of this design has been reduced about 400 lbs. as compared with previous standard cars. It is believed that the design and specifications for these cars are such as to invite healthy competition among builders and to produce a good box car at a reasonable cost.

The Florida Railroad Commission.

The Florida Railroad Commission appointed under the law passed by the last legislature consists of three members. Ex-Congressman R. H. M. Davidson, of Quincy, a lawyer, is chairman. His associates are H. E. Day, of Gainesville, a railroad man, formerly one of the general officers of the Gainesville & Gulf, and for a long time agent of the Florida Central & Peninsular at Gainesville, and J. M. Bryan, a farmer, of Kissimmee.

The Commission organized several weeks ago and prepared rules and rates, and the results of this work were submitted to the representatives of the railroads for their inspection at a public hearing at Tallahassee, Aug. 26.

It must be acknowledged that the board has thus far manifested a conservative spirit that was quite unexpected, in view of the very radical character of the law under which it acts. The proposed rates and transportation regulations will not be put into operation until after the companies shall have had full opportunity to offer objections and amendments The new tariffs make no changes whatever in passenger fares and the freight tariffs of the various roads are accepted bodily by the Commission for the time being, with the single exception of the rates on oranges and vegetables, in which certain reductions are proposed. These reductions apply only to the Florida Central & Peninsular and the Plant System. The rates of the Florida East Coast and the Jacksonville, Tampa & Key West are not disturbed in any way. The classification of the Southern States Freight Association is adopted without change.

For the present therefore the new rates are giving the railroads much less uneasiness than was anticipated. Of more far reaching and immediate importance are the regulations that the Commission purposes to adopt for the conduct of the railroad business generally. These regulations, some 50 in number, are in the main those of the Georgia Commission, with additions from the rules of the Commission that was in existence in Florida in 1889. The freight traffic men spent several hours in consulation over these at the Tallahassee hearing, and even then did not complete the review. Some of the rules are exceedingly ambiguous, and many of them introduce novel and untried ideas. The indications are that at the next meeting of the Commission, the rules will come in for criticism quite as surely as the rates.

The railroads asked for time to consider the proposed regulations, and the Commissioners complied with the request to the extent of postponing the hearing until Sept. 20.

"It is not the desire of the Commissioners to injure the railroads in any way," said Chairman Davidson. "We want, if possible, to create a very kind feeling between the shippers and the citizens generally and the roads."

The Florida railroad law was given in the *Railroad Gazette* of May 14, page 340.

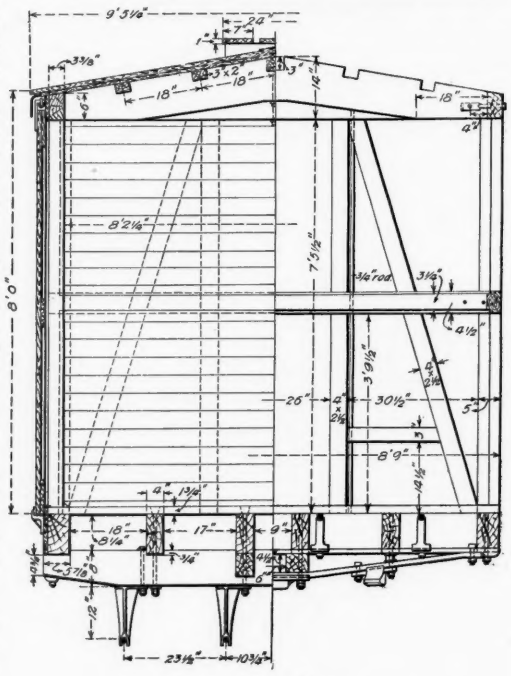
Test of the New Steel Bridge at Niagara.

On Aug 6, we gave some results of a test that was made of the new 550-ft. steel arch railroad bridge at Niagara, late in July, last. This bridge has been fully illustrated and described in these columns from time to time. Our issues of April 24 and Oct. 16, 1896, respectively contain a general description of the bridge with drawings, and a description and illustrations of the abutments; while on April 2, of this year, we told about the closing of the arch span; and again, on April 23, we gave more particulars and illustrations of the bridge.

As will be seen by Fig. 7, the structure consists of a main span, 550 ft. between centers of end pins, and at either end a span of 115 ft. The arch of the main span rises 114 ft. above the skewbacks. The bridge has two decks. The upper one carries two railroad tracks, and the lower one an electric railroad, a wagon road and sidewalks.

The bridge is designed to carry on each railroad track a load of two locomotives with four drivers, 40,000 lbs. to each pair, followed by a train weighing 3,500 lbs. per linear foot. In addition to this, the lower floor is designed to carry a live load of 3,000 lbs. per foot, making a total live load of 10,000 lbs. per running foot. On July 29, the day of the official test, two trains, consisting of heavy consolidation and 10-wheel locomotives with coal cars loaded so as to bring their total weight up to 3,000 lbs. per linear foot, were run across the bridge. These trains were started from the Canadian side of the river and ran side by side on both railroad tracks to the New York end of the bridge, stopping several times to allow of sights being taken in order to ascertain the deflection of the trusses. In addition to the two trains, the lower floor of the bridge was loaded for a distance of about 170 ft. from the Canadian end with 208,320 lbs., and for a distance of about 160 ft. from the American end with 105,280 lbs. Hence the total load applied was 2,300 tons, gross.

The dotted lines in the figures show the camber of



New Chesapeake & Ohio Box Cars

the unloaded structure. At the center of the main span this is $8\frac{7}{16}$ in. at a temperature of 71 deg. Fahr. The solid curves represent the deflected line of camber. The curves showing the deflected camber represent the means of the observations made on both trusses. These were so close that the differences were not within the limits of error of observation or plotting. The apparent slight irregularities in deflection are probably due more to inaccuracies of observation, on account of refraction, than to any real irregularity of settling under the load. The arch assumed exactly the same camber after the load was removed as it had before the load was put on.

Fig. 1 shows the camber of the unloaded bridge and the deflection that took place when a load was put on the end span at the Canadian side. In this case the center of gravity of the head engine was at *A*. Figs. 2, 3, 4 and 5 show the original camber and the deflections when the train had been moved ahead so that the center of gravity of the leading engine had advanced to *B*, *C*, *D* and *E* respectively. Fig. 6 shows the original camber and the deflection when the train had been moved ahead so as to cover the New York end span. The amounts of deflection that were observed at the points *A*, *B*, *C*, *D* and *E*, under the various conditions of loading, can be seen by the figures. In the diagrams 3 ft. on the vertical scale is equal to 40 ft. on the horizontal.

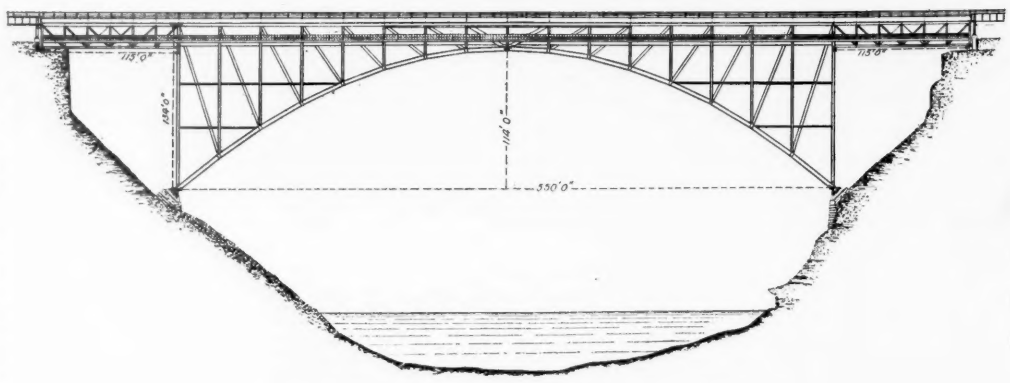


Fig. 7.—New Steel Arch Bridge Below Niagara Falls.

Foreign Railroad Notes.

The Prussian State Railroads have had an increase in earnings every month this year, and for the six months ending with June, the gain over last year amounted to $3,491,000, or 5¼ per cent. The gain is about at the

same rate in passenger and freight earnings. Part of it is due to the acquisition of Hessian railroads, which have been worked since March.

A cog-wheel railroad up Mount Sinai is projected, to have a station where the Empress Helena, mother of Constantine the Great, erected a stone cross, and where, according to tradition, Moses stood when he received the tables of the law. It is connected with a project for a long line from Port Said, through the Isthmus of Sinai and Arabia to Barra, on the Persian Gulf, a route to India.

Grain is a most important part of the traffic of the Hungarian State Railroads. In 1896, they carried 250,000 carloads of it, the maximum carload being 26,500 lbs., and this was 12 per cent. of the whole freight, and the earnings from it were about $6,500,000, which was 20 per cent. of the whole freight earnings. In the first half of 1897, 95,640 carloads of grain were carried, which is a little more than the year before; but a bad harvest will reduce the grain shipments for the rest of the year.

The Persian Railroad Tramway Company having had a decrease of 18 per cent. in earnings from 1895 to 1896 accounts for it by saying that traffic had to be suspended from the end of April till the end of August on account of the condition of the locomotives. A lot of boiler tubes had been ordered for repairs, but they went astray, and a second shipment had to be made. When these arrived, the Shah had been murdered, and the company was forbidden to resume train service on a line past the Holy Place, as an outbreak was feared. Moreover, the Persian currency is seriously depreciated. However, the company was able to pay the interest on its bonds (which amounts to $21,000) and had nearly $1,700 left.

Open-Hearth Steel and Its Manufacture by the Illinois Steel Company.

BY T. L. CONDRON, M. S.

[WITH AN INSET.]

The Illinois Steel Company has three works at Chicago, namely, The North Works, the Union Works and the South Works. It has also the Bay View Works at Milwaukee, Wis., and the Joliet Works at Joliet, Ill. The open-hearth department and plate mill are parts of the South Chicago Works, which include besides eight blast furnaces, three 12-ton Bessemer converters, rail and billet mills and immense ore docks. The open-hearth and plate mill departments were designed by and built under the direction of Mr. S. T. Wellman and were put in operation in February, 1895.

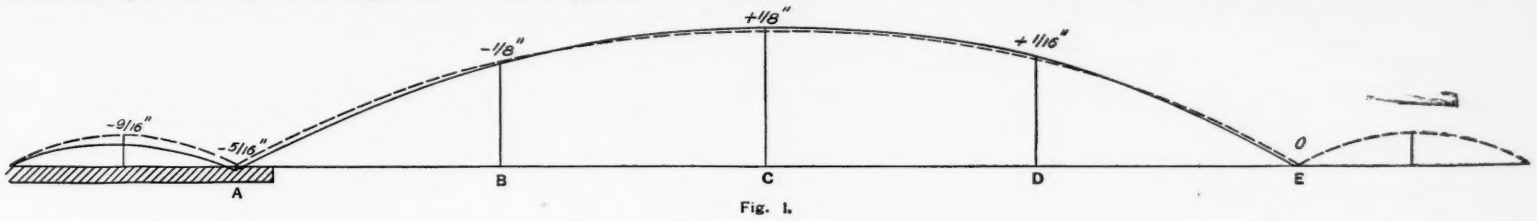


Fig. 1.

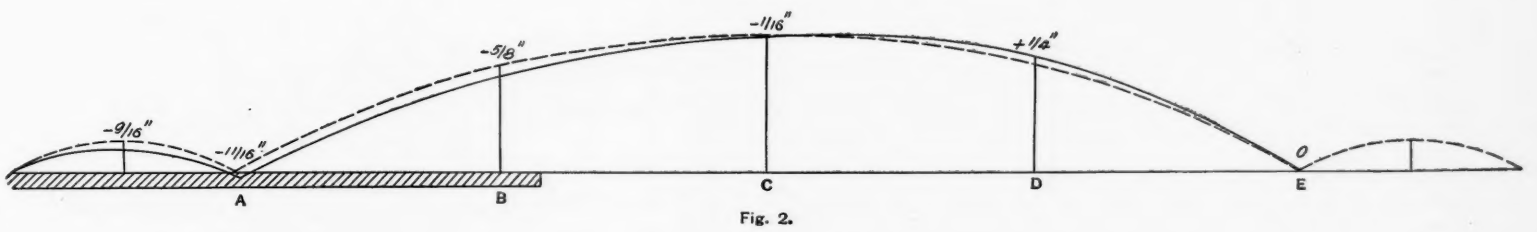


Fig. 2.

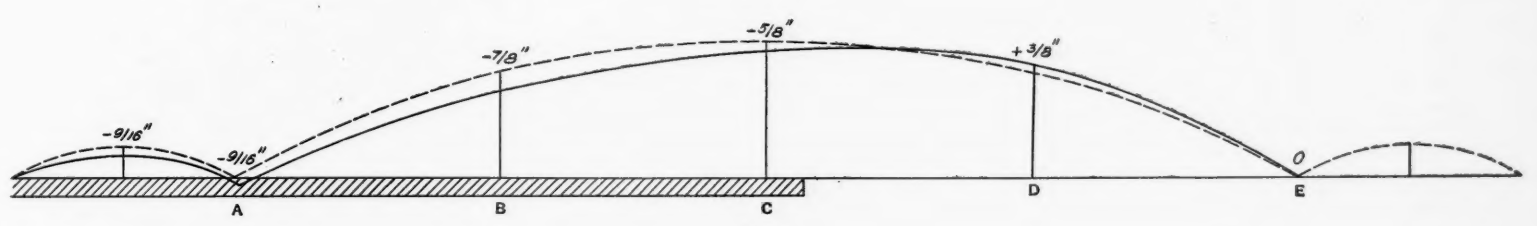


Fig. 3.

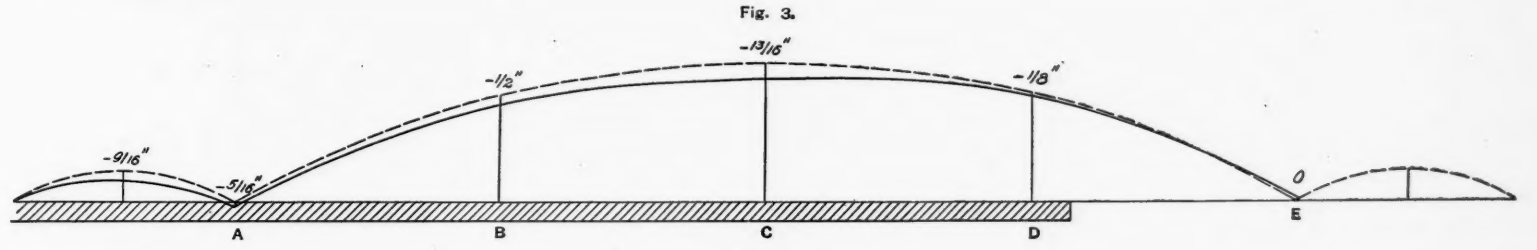


Fig. 4.

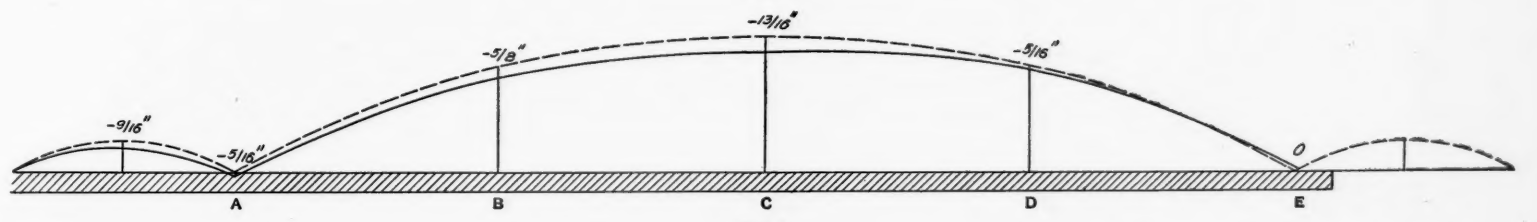


Fig. 5.

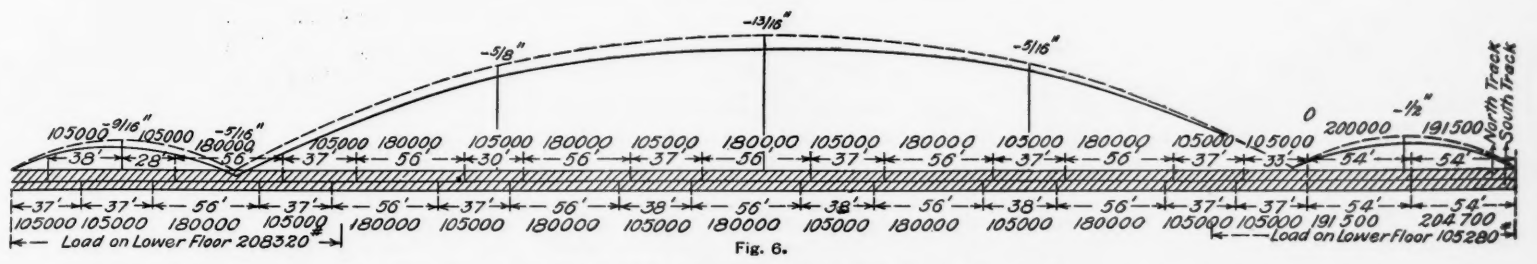


Fig. 6.

Diagrams of Deflection of Niagara Railroad Arch Under Test Load of 2,300 Tons.

Open-Hearth Steel has come to be a familiar term of late years and while many are acquainted with the Bessemer process of making steel, few have had an opportunity to familiarize themselves with the open-hearth process.* The term "open-hearth steel" arose from the desire of metallurgists in the past to dispense with the crucibles, or pots, in which crucible steel was made. In the crucible process a number of crucibles are placed together on the hearth of a furnace. The dream of the earlier metallurgists was to dispense with the laborious handling of these small pots; in other words to make steel directly on the hearth without the use of crucibles, or to make "Open-Hearth Steel." The term does not mean that the molten metal is exposed to the air.

Fig. 1 shows graphically the great development of the steel industry since 1870. It will be seen that England is far behind the United States in the production of Bessemer steel, but is still far ahead of us in the production of open-hearth steel. But we are fast gaining in this direction, and, with the present equipment in this country, bid fair very soon to overtake and pass England in the production of open-hearth steel. In 1882 the production in the United States of open hearth steel was but one-eighth that of Bessemer steel. In 1894 and 1895 not quite one-fourth, and in 1896 it was about one-third. In Great Britain the production of open-hearth steel already exceeds that of Bessemer steel.

Historical Sketch.—The open-hearth process was experimented with for many years, notably by Josiah Heath as early as 1845, but was not made a commercial success until after the regenerative gas furnace was invented by Siemens. In 1856 Dr. Charles William Siemens and his brother Frederick Siemens, natives of Hanover, Germany, but at that time residing in London, and subjects of the Queen, perfected the Siemens regenerative gas furnace. This was the same year in which Henry Bessemer obtained his most important patent. The first patent for the regenerative furnace was granted in 1856 to Frederick Siemens. Dr. Siemens experimented with the regenerative furnace for making cast steel in an open-hearth furnace, and in 1861 was granted a patent for the same. His furnace was not a commercial success. In 1864 Emile and Pierre Martin, with the assistance of Dr. Siemens, erected an open hearth furnace in combination with a regenerative gas furnace. Their principal patent was obtained in France in 1865. In 1867 Dr. Siemens completed a steel works of his own at Birmingham, England. Under an agreement between these inventors the open-hearth-process as developed by them was called the Martin-Siemens process on the Continent, and the Siemens-Martin process in England.

Credit for the introduction of the Siemens-Martin

* References: "Iron In All Ages," Jas. M. Swank, 1892. "Official Report of Special Census Agent," Dr. W. M. Sweet, 1890. "The Manufacture and Properties of Structural Steel," H. H. Campbell, 1896. "Steel," Wm. Metcalf, 1896. "Materials of Construction," J. B. Johnson, 1897.

process in this country is due to the Hon. Abram S. Hewitt, of New York, he having been favorably impressed with what he saw of it on the occasion of his visit to the Paris Exposition in 1867 The first open-hearth furnace built in this country for the manufacture of steel was erected for Cooper, Hewitt & Company at the New Jersey Steel & Iron Company's works in Trenton, N. J., in 1868. The first *basic* open-hearth steel produced in this country was made in March, 1888, at the Homestead Works of Carnegie, Phipps & Company, Limited. Although considerable steel of high grade for boiler plate and such uses had been made by the open-hearth process previous to 1888, it was not until the introduction of the basic process that it came into use for general structural purposes. Since then the progress has been remarkable. In 1896 the total (annual) capacity of open-hearth furnaces in the United States was 2,400,000 gross tons as against 9,400,000 gross tons by the Bessemer process.

Description of Open-Hearth Process.—The earlier open-hearth furnaces were all stationary furnaces, but one of the most modern types is that of the Wellman rolling furnaces of the Illinois Steel Company. One of the latter is shown in Fig. 3. As with the stationary type, the fuel used is producer gas, a mixture of carbonic oxide, hydro-carbons and nitrogen. The gas-producers, *a-a*, Fig. 2, are air tight ovens in which coal is burned with an insufficient supply of air, the latter entering under pressure and regulated as to volume. This gas and air are supplied to the open-hearth furnace through passageways as indicated by arrows, in Fig. 3. They ignite as they enter the furnace and burn with a tremendous heat, thus melting the materials placed upon the hearth. The products of combustion pass from the furnace to the stack, as indicated also by arrows, through a similar series of passages to those through which the gas and air was admitted. In passing out, the waste gases give up practically all of their heat to the walls and checker work of brick in these passages, so that when these gases reach the stack they have a temperature of but 300 to 400 deg. Fahr., while the brick work nearest the furnace has been heated to a white heat. By the opening and closing of valves the direction of these gases is reversed so the producer gas and air are admitted to the furnace through chambers previously heated by the outgoing waste gases and these latter are made to pass off through the other series of passages and in turn heat them. These reversals in the direction of the current of gases are made every 20 or 30 minutes; hence the air and gas are always highly heated before they enter the furnace. The combustion of gas takes place in the upper part of the furnace, directly over the contents. The flame of burning gas is an oxidizing one and comes in direct contact with the melting and molten metal, hence it is necessary to so charge the furnace at the start as to provide for a slag which will cover the bath of molten metal and prevent an excessive wasting of iron by oxidation.

Ferro manganese is added to the product of the open-hearth furnace, the same as to the Bessemer product. In the Bessemer process, either ferro-manganese or spiegeleisen is added as a recarburizer as well as to supply manganese. In the open-hearth process these are not used as recarburizers, but owing to the great affinity oxygen has for manganese, part of the manganese combines with the oxygen present in the bath. It is absolutely necessary to remove this oxygen or the steel will be "red short." It is equally essential that a certain percentage of manganese remain in the steel in order that the steel shall have strength enough when hot to permit it to be successfully rolled. As carbon increases the cold strength of steel, so manganese increases its strength at rolling and forging temperatures. In this process spiegeleisen or ferro-manganese is usually added, in solid form, to the bath in the furnace, and it is possible for it to become very thoroughly mixed with the bath, as ample time can be allowed for the desired chemical reactions.

Open-Hearth versus Bessemer Process.—Some of the advantages of the open-hearth process over the Bessemer process are: First, iron and steel scrap can be remelted and made over into new steel, but while large quantities of scrap can thus be used with pig iron and ore, it is also possible to charge the furnace with pig iron and a larger quantity of ore. Second, the quality of the steel can be determined during the melting by taking out and casting small samples of the metal before the final pour is made, and analyzing the same to determine the character of the contents of the furnace. Third, the quality of the steel can be largely regulated by the operator by adding such ingredients as are found, by preliminary analysis, to be needed. Fourth, the time for reactions is much longer than in the Bessemer process, and the heat used being extraneous instead of due to oxidation in the bath itself, as in the Bessemer process, it is under the control of the operator, so that there need be neither cold heats nor over-hot heats.

By the Bessemer process cast iron is converted into steel in from 10 to 15 minutes, and great skill is required to determine when to stop the blast in the converter, as a few seconds too few or too many may seriously affect the character of the product, and there is no opportunity to make an examination of the steel before it is finally cast. In contrast to this, the open hearth process is a slow one, requiring from 8 to 12 hours, and the steel may be held on the hearth for considerable time without injury. As there is time for a more perfect admixture of carbon and manganese with all of the iron on the hearth, a more uniform and homogeneous steel is secured by the open-hearth process than by the Bessemer process.

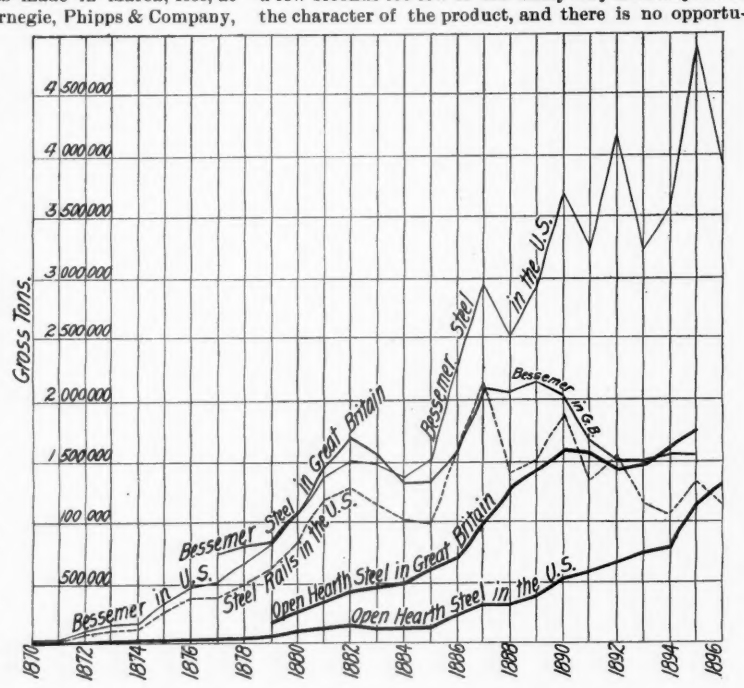


Fig. 1.—Production of Bessemer and Open-Hearth Steel.

Basic Open-Hearth Process.—The basic process consists in melting a charge of pig iron and scrap, to which iron ore is added after the bath is melted, together with basic material to form a basic slag, which slag will combine with part of the phosphorus in the iron, thereby producing a low phosphorus steel. But as this basic slag would unite with the lining of a sand-lined furnace and liquify the lining, it is necessary to line the hearth with magnesite, dolomite, lime or other basic or passive material and such a furnace is known as a basic furnace. A sand-lined furnace is called an acid furnace. Ores and pig iron containing considerable phosphorus can be used in basic furnaces with good results, while with acid furnaces great care must be exercised to prevent the introduction of high phosphorus iron, as none of the phosphorus is removed from the iron in the acid process. The lining of the furnace is supposed to be inert in both processes.

Open-Hearth Furnaces of the Illinois Steel Co.—A general plan of the open-hearth department and plate mill is shown in Fig. 2. Two open-hearth furnaces, like the one soown in Fig. 3, have been built under the direction of Mr. C. E. Stafford, Manager of the open-hearth and plate mill of this company, and are a modification and improvement upon the Wellman furnaces, Fig. 6, first built for this plant. This furnace differs from the original Wellman furnace, principally in that the ports for the inlet of air and gas and for the escape of the products of combustion are stationary. As will be noted from the sectional views in Fig. 3, these ports are in no way attached to the rolling furnace, thus making the construction of the ports less complicated than where they are attached to and revolve with the furnace. These ports are removable, thus facilitating repairs. When the furnace is in an upright position the port openings are opposite to the corresponding openings in the ends of the furnace. As the furnace rolls forward, for the molten metal to flow out of the spout, the port holes become partially covered. During the pouring the supply of air and gas is shut off. One of the greatest advantages of this type of furnace is that there is no tapping required at the spout. In a stationary furnace the spout has to be sealed with a refractory material during the melting of the charge and oftentimes it happens that the tapping of this seal is attended with considerable difficulty and delay, requiring the charge to be held on the hearth, when, for the best results, it should be poured at once. Another advantage is found in the opportunity that is afforded to repair the bottom in case of accident while a charge is on the hearth. The furnace may be rolled so as to raise the bottom until it can be temporarily repaired, when the furnace can again be rolled into position and the process continued. Another advantage is that it is possible to withdraw a charge from one furnace into a ladle and in turn pour it from the ladle into another furnace by tilting the spout of the furnace up to receive the flow from the ladle. All of these features tend to place the making of steel under the perfect control of the operator and so eliminate many of the previous obstacles to securing good steel at every pour. With these rolling furnaces there is a great saving in manual labor, for the sealing and tapping of stationary furnaces involves an immense amount of hard manual work.

Effects of Working and Carbon Upon Steel.—It seems appropriate here to call attention to two important facts concerning steel: First, the quality of the finished product depends as much upon the heat treatment it has received in the furnace, at the time of casting, and finally during the rolling, as it does upon the chemical composition within a wide range. Second, because of the greater amount of work done at a lower temperature upon thin material than upon thick, it is necessary to supply strength to the thicker material by increasing the percentage of carbon over what is needed for thin material. In thin material the strength is largely the result of the mechanical work done upon the steel; in thick material it depends more upon the chemical composition of the steel.

The Open-Hearth Department.—In the general plan of the open-hearth department and plate mill shown in Fig. 2 *A A A A* and *B B* are Wellman rolling furnaces, the former of 50 tons' capacity each and the latter of 25 tons' capacity each, per charge. *C C C C* are Wellman stationary furnaces of 25 to 28 tons' capacity each. *D-D* are casting pits. The charging floor of the furnaces is 12 ft. above the ground level and is reached by an inclined narrow-gage track running back of the gas producers and curving into the open-hearth building at the left. Suitable switches permit cars to be run back of the furnaces. The charges for the furnaces are delivered in iron boxes carried on small cars. These boxes are so made that they can be lifted from the cars by the Wellman electric charging machines, one of which is shown in Fig. 5, and also in Fig. 3. These machines have an arm which lifts the boxes and after passing them into the furnace, turns them over, discharging the contents just where desired by the operator and then withdraws the emptied boxes. This particular feature works admirably, being a great improvement over the more common method of charging by hand. The charging of both the stationary and rolling furnaces at the Illinois Steel Company is similarly accomplished. The charging doors are seen in Fig. 5. One 20-ton electric traveling crane spans the charging floor and furnaces and runs the entire length of the building, while two 75-ton, one 40-ton and two 30-ton electric traveling cranes span the space over the casting floor and likewise run the length of the building. These latter cranes carry the ladles, into which the molten metal is run from the furnaces, and from which, in turn, the ingot molds are filled. These ladles are of 20 and 50 tons' capacity each. Ingots are either top or bottom poured as required. When bottom poured several molds surround a central gate connected with the molds by runners at the base. The metal is tapped from the bottom of the ladle by a valve operated by a lever. Fig. 6 shows a pour being made from one of the tilting furnaces into a ladle. This view also shows the top of one of the casting pits, with ingot molds in place for casting. There is, in addition to the ordinary casting pits, suitable for usual-sized ingots, a steel-lined casting pit, 30 ft. deep, in which ingots of from 100 to 150 tons may be cast.

Under the very efficient management of Mr. C. E. Stafford, Manager of the open-hearth and plate mill, and the assistance of Mr. J. W. Galvin, Superintendent of the open hearth, this plant has been brought to a high state of perfection, and the quality of the product equals that of any mill in the country. All grades of special quality steels for boilers and locomotive fireboxes, as well as for forgings, castings, springs, wire and cutlery and for bridges and other structural purposes are made here.

Foreman Ehrol
Furnace 21
6897 Heat
2210 Weight
10x36 Size
Section
Gauge
E. L.
T. S.
Elong
Red
Rolled for Fox

Form A 62. 500. 2/97

ILLINOIS STEEL CO. PLATE MILL. 90

C.	Mn.	P.	S.	H. F.	No.	Date	Number
19	36	02+0	33	4	8/13		4

ROLLED HEATED

Exact gauge

291

M. O.	Gauge	Width	Length	Marks
66	78	1/2	31 1/2	134

Fig. 9.– Rolling Card—Illinois Steel Co

Laboratories.—The chemical and physical laboratories of the South Works are probably the most completely and perfectly equipped of any in the country.

The Plate Mill of the Illinois Steel Co.—The plate mill is operated in connection with the open-hearth department. The location of the two plants with reference to each other is clearly shown in Fig. 2, while Fig. 4 is a detailed plan of the plate mill alone. As will be seen by Fig. 2, a complete system of broad and narrow gage tracks connects the two plants.

Steel which is to be rolled into plates is usually cast into slab-shaped ingots. These ingots are from 8 in. to 24 in. thick, from 18 in. to 30 in. wide, and from 2 ft. to 5 ft. long. Much larger ingots are cast for special forgings.

Reheating Ingots.—Referring to Fig. 4, ingots are delivered to the plate mill on small cars over the track *A A A*. This track passes throughthe "pre-heating furnace" from right to left as shown. By passing the loaded cars slowly through the "pre-heating furnace," the ingots are delivered partially heated to the heating furnaces, and hence the danger of injury to the steel arising from placing a chilled or frosted ingot directly into a hot furnace is obviated, and, moreover, the pre-heating furnace materially increases the number of ingots that may be handled in the heating furnaces. The ingots are charged into and withdrawn from the heating furnaces by two Wellman charging machines which are so designed as to lift the ingots from the cars and deposit them in the furnaces by mechanisms controlled by a single operator for each machine. When an ingot has become sufficiently and uniformly heated throughout, it is withdrawn from the furnace and delivered upon one or the other ot the roller tables *B* or *C*. These tables are simply sets of horizontal rollers which are driven by a 6 in. × 8 in. reversing steam engine *D*. By the revolution of these rollers the ingot is carried forward to the table *E* or *F*, the surfaces of which are made up of small rollers driven by the 8-in. × 10-in. reversing engines *G* and *H*, which likewise operate the tables *I* and *J*. These tables are raised and lowered by hydraulic power so as to pass the ingot successively above and below the middle roll of the rolling mill *K* or *L*. Fig. 7 is a view of the two rolling mills *K* and *L* as viewed from a point back of the tables *B* and *C*.

Rolling Plates.—The mills are what are termed "three-high, Lauth mills." One is a 90-in. and the other a 132-in. mill. The latter is the largest plate mill in operation in the country at the present time. These mills each have three rolls. In the larger mill, *K*, Fig. 4, the top and bottom rolls are each 132 in. long, in the clear, by 36 in. in diameter, while the middle roll is of the same length and 22 in. in diameter. In the smaller mill the rolls are 90 in. long by 34 and 22 in. in diameter respectively. One 54 × 66 in. Porter-Allen engine of 3,000 H. P. drives both of these mills. A part of this engine is seen on the left in Fig. 7.

In the process of plate rolling, the rolls are revolved continuously without reversal. The ingots pass successively forward between the middle and lower rolls and backward between the middle and upper rolls. The number of passes required to reduce an ingot to a plate varies from 25 to 35, depending upon the size of ingot and the required thickness of the finished plate. On account of the greater wear of the rolls at the middle than near the ends, and also to the spring in the rolls when a plate is passing through, plates are always slightly thicker along the center line than at the edges. This is more marked in thin plates (finished at lower heat) than in thick plates. The "head roller" gages the thickness of plates during the progress of rolling by a spring caliper, which enables him to measure the thickness near the edge to the nearest one thousandth of an inch. He signals to the "screw man," who stands on a platform directly over the rolls, how close to set the rolls for each pass.

Only the top and bottom rolls are connected with the engine. The bottom rolls are fixed in horizontal position, while the top rolls are so counterbalanced as to always press against the lower ends of large screws. In order to change the space between the rolls these screws are screwed down or up, in the former case pressing the upper roll down and in the latter case permitting the counterbalance to raise the upper roll against the ends of the screws. The middle roll is raised or lowered by hydraulic power. When an ingot is passed under the middle roll that roll is raised by the hydraulic pistons, so that it is pressed against the upper roll, which supports its whole length and causes it to revolve by friction. In the upper pass of the ingot the middle roll is dropped down upon the lower roll. By the support thus afforded by the top and bottom rolls to the middle roll, this roll can be made lighter, as it has less bending to resist.

Straightening Rolls.—After a plate is rolled to the required thickness it is passed over the table *M* or *N*, the rollers of which are driven by the 8-in. × 10-in. engine *O* to the "hot bed," where it lies until it is cool. If it is then "buckled" as a result of having received more work along the edges than along the center, it is passed through one or the other of the cold rolls *P* or *Q* for the purpose of straightening out the buckles. These rolls are one of the unique features of this mill and insure perfectly flat plates being furnished, which for many uses are demanded.

Electro-Magnet Cranes.—Another unique feature of this mill is the method of handling plates by means of Wellman electro-magnets. The handling of plates upou the "hot bed" and delivering them to the stock racks and shears is accomplished by two electrically driven overhead conveyors. One of these conveyors is furnished with chains and hooks in the usual way. In order to pick up a long or short plate with this conveyor it is necessary to place under the edges of the plate two or more pairs of iron hooks, requiring the assistance of two "hookmen." When the plate is delivered where it is wanted, these men have to remove the hooks. In contrast to this crude method of handling plates is the operation of the electro-magnet conveyor, a view of which is given in Fig. 8. Suspended from this conveyor are seven electro-magnets in a single line across the width of the "hot bed." Each magnet is capable of lifting by magnetism 5 tons of steel, requiring 4 amperes on a 240-volt current. A plate 60 ft. or less in length is readily picked up by these magnets and conveyed to where it is wanted and then deposited by simply cutting off the current from the magnets, when the plate instantly drops. There is no placing or removing of hooks, and one man can operate the entire conveyor. This same system of handling plates is used on the two 5-ton cranes which serve the shears and load plates at the shipping tracks as shown in Fig. 4. Each one of these two 5-ton electric traveling cranes is furnished with one 5-ton electro-magnet which is capable of picking up and transferring and delivering plates where wanted without the use of hooks. This is especially desirable when loading plates into gondola cars, as when hooks are used it is very troublesome at times to get the hooks from under plates in such cars.

Shearing.—From the "hot bed" or stock rock plates are delivered to the 132-in. shear *R*, Fig. 4, which is capable of shearing plates 1¼ in. thick and the full width of the shear. At this shear only the ends of the plate, as rolled, are cut off and then the plate is passed to the 110-in. or 100-in. shears to have the edges trimmed There is also a rotary shear for shearing boiler heads and other circular plates. The space around the shears is filled with goose-neck casters, which are merely vertical iron posts spaced about 2 ft. centers, on the top of each of which is an iron wheel revolving vertically and free to swing around its supporting post. Over these casters the heaviest plates can be readily shoved by a few men from one shear to another, and over the weighing scales, on a level with the shear tables. As is shown in Fig. 4, the shear-room is served by two 5-ton electric traveling cranes, referred to above.

Melt Numbers and Identifying Marks.—Each separate cast from an open hearth furnace or Bessemer converter is given a serial number by which the metal is thereafter known. The ingots, after removal from the molds, are each stamped with their proper "heat number." When an order for plates is received at the plate mill it is necessary to select such ingots as will be suitable to fill the specifications for quality and the requirements as to sizes of plates. Certain melts are selected as being suitable by reason of their chemical composition, determined by the analyses made in the laboratory, records of which have been sent to the plate mill. Ingots of proper size from such melts are ordered into the mill and placed in the heating furnaces in a regular routine. The "head roller" is furnished with a card, such as shown in Fig. 9, for each ingot, giving the size of plate to be rolled therefrom. He rolls according to these cards and notes any accident that may result in the loss of a plate or a change in the order in which ingots are rolled. The "hot-bed" man or "layer out" marks the plates in the order in which they reach the "hot-bed" so as to identify them from the cards he receives in turn from the "roller." As soon as the plates are sufficiently cool they are marked with the heat number, order number and for whom intended and the sizes to which they are to be sheared. They are then "laid out" with chalk lines to guide the shearmen as to show they are to be sheared. The melt numbers are stamped into the steel, and all other marks are painted on with white lead. Such plates as are to be cut for tests are so marked, and four or eight test pieces, 18 in. long by 2 to 3 in. wide, are marked to be sheared off. Match marks are made on all test pieces so that after shearing they can be identified with the plate from which they were cut, if necessary.

Tests and Inspection.—After the test pieces are sheared off they are taken to the milling machine, where they are milled into proper shape. Each test piece bears the marks of the plate from which it was cut, showing the heat number, the order number and from what part of the plate it was taken. Both tension and bending tests are made upon these test pieces, and in special cases other tests, as may be required by the specifications. On orders subject to inspection by a representative of the purchaser these tests are made in the presence of such inspector, who keeps a record of the same. After the necessary or required tests have been made the inspector makes a list of accepted melts, noting any melt which may have failed on test. With this list in hand he is able to identify every plate on his order and will know if it is from a melt that has passed satisfactory tests.

In the space between the weighing scales and the shipping track, Fig. 4, the final inspection of plates is made. For the purpose of exposing the plates for careful surface inspection, each plate is suspended from one of the magnets, enabling the inspector to examine the under side. In case he discovers a defect, the plate is passed over the inspection pit *V*, Fig. 4, where it rests upon goose-neck rollers. The pit is supplied with a number of incandescent electric lights, which enable a thorough examination to be made to determine if the defect is an injurious one or not. If the plate thus examined is found acceptable, it is stamped by the inspector and loaded into a car for shipment. If an injurious surface defect is discovered the plate is rejected and is removed by the crane to the back of the shear-room. Such a plate may be cut into a smaller plate, or it may have to be cut up into scrap and returned to the open-hearth department to be remelted.

Management.—The plate mill and the open-hearth department are both under the management of Mr. C. E. Stafford, formerly connected with the Schoenberger Steel Co., of Pittsburgh, Pa. The Superintendent of the plate mill is Mr. W. G. Clyde, formerly Superintendent of the plate mill of the Wellman Steel Company at Thurlow, Pa. The General Superintendent of the South Works is Mr. E. A. S. Clarke, and to these gentlemen the writer wishes to acknowledge his indebtedness for the courtesies afforded him in the furnishing of material for this description of one of the most modern and complete steel plants in the country.

The Mississippi Levees and the Flood.

Major H. B. Richardson, Chief State Engineer of Louisiana, addressed last June to Colonel Gillespie, Corp of Engineers U. S. A., President of the Mississippi River Commission, a letter reviewing the experience with the levees of the lower Mississippi during the recent flood and making some recommendations. This letter has lately been made public, and we print below some extracts from it. It appears that the letter was written in compliance with a request from Colonel Gillespie for a report to be made for the information of the Mississippi River Commission.

The Percentage of Levee that Failed.—The lines of levee upon the efficiency of which the low lands of Louisiana depend for direct protection against overflow by the flood waters of the Mississippi River extend on the right bank from Costello's Gin, on Amos Bayou, Ark., to the Jump, near the head of the passes, and on the left bank from Baton Rouge to Bohemia.

On the right bank, just previous to the present flood, the line was continuous, except the outlet openings into the head of the Atchafalaya River and into Bayou Lafourche, and the gap of about 26 miles between Bougere landing and the mouth of Red River, which has remained practically unleveed for the past 30 years. During this flood four crevasses occurred in this line, which have not been closed, all of them above the mouth of Red River.

On the left bank, the line previous to the flood was unbroken and remained intact until the break at Conrad Point, May 30, when the crest of the flood had passed and the water had fallen some 2½ ft.

The present flood of the Mississippi River has also called into service the levees on the Atchafalaya and on Bayous des Glaizes and Lafourche. Three small crevasses occurred on Bayou des Glaizes in a part of the line where the natural bank is so high that slight levees have been built there only upon the approach of high water, while there were three crevasses in the lower part of the levee system of Bayou Lafourche.

The total length of the levee lines above referred to is 816 miles on the Mississippi River and 256 miles on interior streams, an aggregate of 1,072 miles. The total width of crevasses is about one mile on the Mississippi and less than three-quarters of a mile on interior streams, an aggregate of one and three-quarter miles. That is, 99.87 per cent of the levee line on the Mississippi River upon which Louisiana is directly dependent for protection, and 99.71 per cent. of the line in service this season on her interior streams, or 99.84 per cent. of the aggregate, remains intact and thoroughly efficient.

The broken links in this chain of levees have been so near its ends as to leave the body of the chain sound, strong and efficient for the control of the flood.

Efficiency of Levees for Protection.—The area of the Pontchartrain, Lafourche and Atchafalaya basins, lying wholly in Louisiana and of the Tensas Basin lying in Louisiana and Arkansas, as given on the "Map of the Alluvial Valley of the Mississippi River," published by the Mississippi River Commission, is 15,065 square miles; while the value of the taxable property, as shown by official tax rolls, is in round figures $180,000,000 in Louisiana alone. There can hardly be a reasonable doubt that nearly every acre of this vast territory would have been deluged had there been no levees to prevent. As a matter of fact, however, this flood was so efficiently controlled by levees that over 85 per cent. of the gross area of these lands was completely protected from any overflow escaping through the crevasses of this season. This estimated 85 per cent. of the gross area, of course, includes a vastly greater proportion than 85 per cent. of the land open to cultivation.

Notwithstanding the fact that this flood reached much higher stages in the river than any previously recorded, by nearly 3½ ft. along some parts of the levee lines, in Louisiana, and by over 2 ft. against the major part of them, it is to be noted that every drop of it (except the insignificant volume escaping through the crevasses on Bayou des Glaizes) was successfully carried between levees, from the head of the Atchafalaya Basin to the end of the levee system near the gulf. Not until two weeks after the flood had culminated and it had fallen 2½ ft. was there any break in the levee or escape of flood waters through crevasses below the mouth of Red River, on either the Mississippi or the Atchafalaya, and on Bayou Lafourche, only after passing 40 miles down the stream between levees.

This flood was certainly held in complete control until two weeks after its crest had passed, in the Mississippi from the head of the Atchafalaya to Bohemia, a distance of 257 miles; in the Atchafalaya, from its head to Melville, a distance of 35 miles, and in Bayou Lafourche, from its head to below the Southern Pacific Railway crossing, a distance of 40 miles.

This efficiency of control was partly due to the immense amount of labor and material expended during the progress of the flood for the protection and preservation of the levees. But the fact should not be lost sight of, that the major part of the work thus done was applied to giving greater margin of height to the exist-

(*Continued on page 622.*)

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The new interchangeable mileage ticket, which was to clear the traffic atmosphere in the central states like a balloon-full of ozone, has had most of the buoyancy knocked out of it, even before it begins its mission. The Chicago, Indianapolis & Louisville refuses to use or honor the tickets and its name has been scratched off from all that have been sold. Mileage tickets are used largely for competitive business between Chicago and the Ohio River (Cincinnati and Louisville), and this road complains that the other roads do not live up to an agreement by which they were to lengthen the times of some of their trains. With time schedules as they are the C., I. & L. feels at a disadvantage and so reserves the option of selling tickets to competitive points at less than the price asked for the 1,000-mile books (net 2 cents a mile) The Erie and the Toledo, St. Louis & Kansas City have stood aloof all the time, so that the scheme, based on this ticket, for correcting the long-standing ticket abuses in this scalper-ridden territory has to be launched with three big holes in it. It is a pity that a device embodying such decided improvements on former conditions cannot have a thorough trial (and indeed it is possible that it may, in spite of drawbacks); but everyone must recognize that at best this is a remedy which falls very far short of meeting the difficulties that need to be cured. A mileage ticket is a nuisance at best. With it honest conductors make mistakes, careless ones let the company be cheated, and dishonest ones themselves do the cheating, finding plenty of passengers to co-operate with them. Requiring the coupons to be surrendered at ticket offices prevents some of the evil, but the requirement is such an irritation to drummers that it largely neutralizes their satisfaction with the discount they receive. Even if such a ticket were justified by good business reasons there is no equitable ground for making such a large difference between the price per mile and the price (3 cents a mile) asked for single-trip tickets. Citizens who believe in regulating rates by specific legislation stick to the theory that the rate to all passengers should be precisely the same, and a discount of 33⅓ per cent., while not entirely without justification, fails to satisfy a sufficient proportion of the people who travel to offset the dissatisfaction of those who want low rates for everybody. The use of mileage tickets for regular through competitive business is, of course, a perversion of the mile-coupon form and ought to be abolished. The mileage ticket never would have come into such general use for that purpose if some one had not thought it a fine arrangement for making scalping appear respectable; but of course every one now knows just how thin a disguise this is, and there can be no good reason for continuing it.

The one most thorough and, we believe, most reasonable remedy for the very unsettled condition of the passenger traffic field in the Central states is a general rate of two cents a mile for local tickets to all stations. Such a reduction would be a bold and radical step, but we have heard it favorably spoken of by experienced and conservative traffic officers for some time past. There is little question that it would produce new business to justify itself, and that within a short time; some think within one year. The railroads of Ohio, Indiana and Illinois form the typical spider's web; so many lines that it will never be possible for all to get good rates, and junctions so frequent, on every line, that competitive rates affect all or nearly all the business at non-competitive stations. Under such conditions the maintenance of anything but very low rates will always be a difficult matter. On the other hand, uniform rates, as low as any in effect anywhere in the country, should have a powerful effect as a sedative on the public, and even on the petty politicians who make it their business to keep the public agitated. The abandonment of the great differences between through and local fares and between the rates to retail and those to wholesale buyers of transportation would abate a great amount of friction and would tend to kill off some of the scalpers. Possibly it might, in addition, kill or fatally wound a few sensational reporters, who subsist on passenger wars and war rumors. an added blessing for which everyone would be thankful.

The gross earnings of the railroads of the United States for the half year to July 1, as reported by the *Commercial and Financial Chronicle*, have just barely held their own. In exact figures, the net decrease, as compared with the first half of 1896, is $1,115,001; a large sum, but it is only one-fifth of one per cent., the earnings reported being those of 229 roads (including Canada and Mexico); for 1897, $505,908,395; for 1896, $507,023,396. While, however, this difference between the total increases and the total decreases makes such a very small net difference in the gross amount the table is of significant interest as showing the territorial distribution of the improvement in business during the current year. It has been a matter of common knowledge that not only confidence, but actual prosperity has boen more noticeable in the South and West than in the Eastern and Northern States. The *Chronicle's* figures confirm this; in a table of 37 roads, on which there have been increases of more than $100,000 each, four-fifths of the companies are in the South or West, with perhaps a larger showing in the South than in the West. The largest increase is on the Mexican Central, and the next largest, $1,349,730, is on the Chicago, Burlington & Quincy. The other roads which have gained more than half a million are the Union Pacific, the Atchison, the Baltimore & Ohio, the Mexican National, the Canadian Pacific and the Missouri Pacific. On the other hand, the roads showing losses over $100,000 are largely in the Northern and Central states. Those showing losses above half a million are the Pennsylvania (east and west), the Reading, the Chicago & Northwestern, the Lehigh Valley, the Chicago, Milwaukee & St. Paul, the Lackawanna, the Lake Shore and the Norfolk & Western. It is to be borne in mind, of course, that all these statistics ended two months ago. The hopefulness now prevailing in business circles everywhere is based on improved conditions which have become manifest within the last six weeks. The New York Central, for instance, does not figure in either of the lists just mentioned, but for the month of August the "street" predicts that the Central's earnings will show an increase over last year of $400,000.

The Railroads of the United States in 1896.

We have received advance sheets of the introduction to Poor's Manual for 1897, giving the statistics of the railroads of the United States for 1896.

In the table showing the extent of the railroads in various states, running back as far as 1830, we find that the miles in operation at the end of 1896 were 182,600, the increase from 1895 having been a trifle less than 1,700 miles. The year before the increase was 1,500 miles, but nothing so small as this is found in any one year, until we get back to 1865, when the increase was 1,177 miles. This is really an astonishing fact, that in each one of 30 years more miles of railroad were added to our system than the last year. The increase in 1893 was nearly 2,300 miles, and in 1894 was 1,900 miles. Going back we find that the amount of new railroad built year by year decreased gradually each year from 1887, in which year the addition to our mileage was 12,878 miles. The next year there was a sudden drop to 6,900 miles. We do not pretend to express any opinion as to whether or not the country can yet stand any large addition to its mileage, but it certainly cannot until investors in railroads are permitted and enabled to earn more money on their investments. The obstacles to this are so well known and have been so often set forth in the last few years that we need attempt no further elucidation of that part of the subject.

The capitalization of the railroads of the United States is now nearly twelve billions of dollars, and Senator Chandler and others who, using last year's statistics, have spoken of an "eleven billion dollar trust," should revise their figures. Of the 182,600 miles shown in the reports, only 181,394 miles was completed at the close of the respective fiscal years, and on that mileage the liabilities and assets are as follows:

	Reporting operations. (178,549.33 m.)	Not reporting operations. (2,844.84 m.)
Liabilities:		
Capital stock	$5,290,730,567	$82,457,252
Funded debt	5,416,074,969	45,781,629
Unfunded debt	339,502,302	4,997,667
Current debt	386,382,440	2,931,479
Profit and loss	535,853,808	2,941,524
Total liabilities	$11,968,544,086	$139,109,551
Assets:		
Cost R. R. and equipment	$9,953,767,710	$125,728,710
Investments	1,450,418,025	7,238,185
Other assets	231,915,121	558,649
Current accounts	161,396,357	1,124,611
Profit and loss	171,046,873	4,459,396
Total assets	$11,968,544,086	$139,109,551

The total funded debt, $5,461,856,598, is $179,085,969 less than was reported for 1895 on only 179,821 miles, a decrease of 3.17 per cent.

The number of miles reporting traffic statistics, earnings, etc., was 180,891, an increase over the year before of 1,738 miles. On this mileage the tons of freight moved amounted to 733,868,716, an increase over the preceding year of 2.4 per cent. The ton miles increased in greater ratio. namely, six per cent., and amounted to 93,886,000,000. The passengers carried increased a trifle more than one per cent. in number and 3.54 per cent. in passenger miles. Something more than 535 million people were carried and the passenger miles amounted to 13,055 million.

The earnings from freight as compared with 1895 increased 3.58 per cent., the earnings from passenger traffic increased 1.68 per cent., the total gross earnings increased 3.04 per cent., and the net earnings increased 3.24 per cent. The total gross earnings were $1,125,632,025 and the total net earnings were $332,333,756. The average fare received per passenger per mile was 2.032 cents, being .037 cent less than in the preceding year, and, in fact less than in any year heretofore recorded except 1894, when it was 2.025 cents. The increased passenger mileage, however, was sufficient to give larger passenger earnings per mile of railroad than in the preceding year, but they were smaller than in any other year in the history of the roads, having averaged only $1,467.

The average freight rate was the lowest on record, which has been true of almost every year for a long time back. The average rate in 1896 per ton per mile was 0.821 cent, a decline from the preceding year of 0.018 cent. Nevertheless, the ton miles increased and the average freight train load increased and the average haul increased sufficiently so that in 1896 the freight earnings per mile of railroad were greater than in either of the two preceding years, and in fact nearly as great as in any one of a dozen years back, namely, $4,259.

Last year the gross earnings per mile (including besides freight and passenger a considerable sum classed as miscellaneous) were $6,223, which was somewhat more than in either of the two preceding years, although less than in any other one year in the tables before us, which go back for 12 years. The net earnings per mile were $1,837, which is also greater than in either 1894 or 1895, but materially less than in any other one of the 12 years. The interest paid on the total bonded debt amounted to 4.43 per cent. and the dividend paid on the total share capital amounted to 1.54 per cent. This last figure is the lowest ever touched and surely it is a melancholy one. We cannot tell what percentage of the share capital of the railroads of the United States paid no dividend at all until the figures of the Interstate Commerce Commission appear; but in the year ending June 30, 1895, more than 70 per cent. of the railroad stock of the country received no dividend.

There was a small increase in the amount of rolling stock of the railroads in spite of the very limited earnings of the last few years, and in spite of the fact that so much rolling stock has been standing idle in sheds and on sidings since 1893. The locomotive engines at the end of 1896 numbered 36,080, fewer than the year before, but more than in any other year. The passenger cars numbered 24,788, being about 1,700 fewer than in 1895, and fewer also than in any one of the four preceding years. We suspect, however, that there have been errors in the figures collected for some of these years, although it is possible that the passenger equipment has actually declined in amount. The freight cars numbered 1,250,061, being about 20,000 more than in 1895, and more than in any other year recorded, making, therefore, the aggregate revenue cars somewhat more

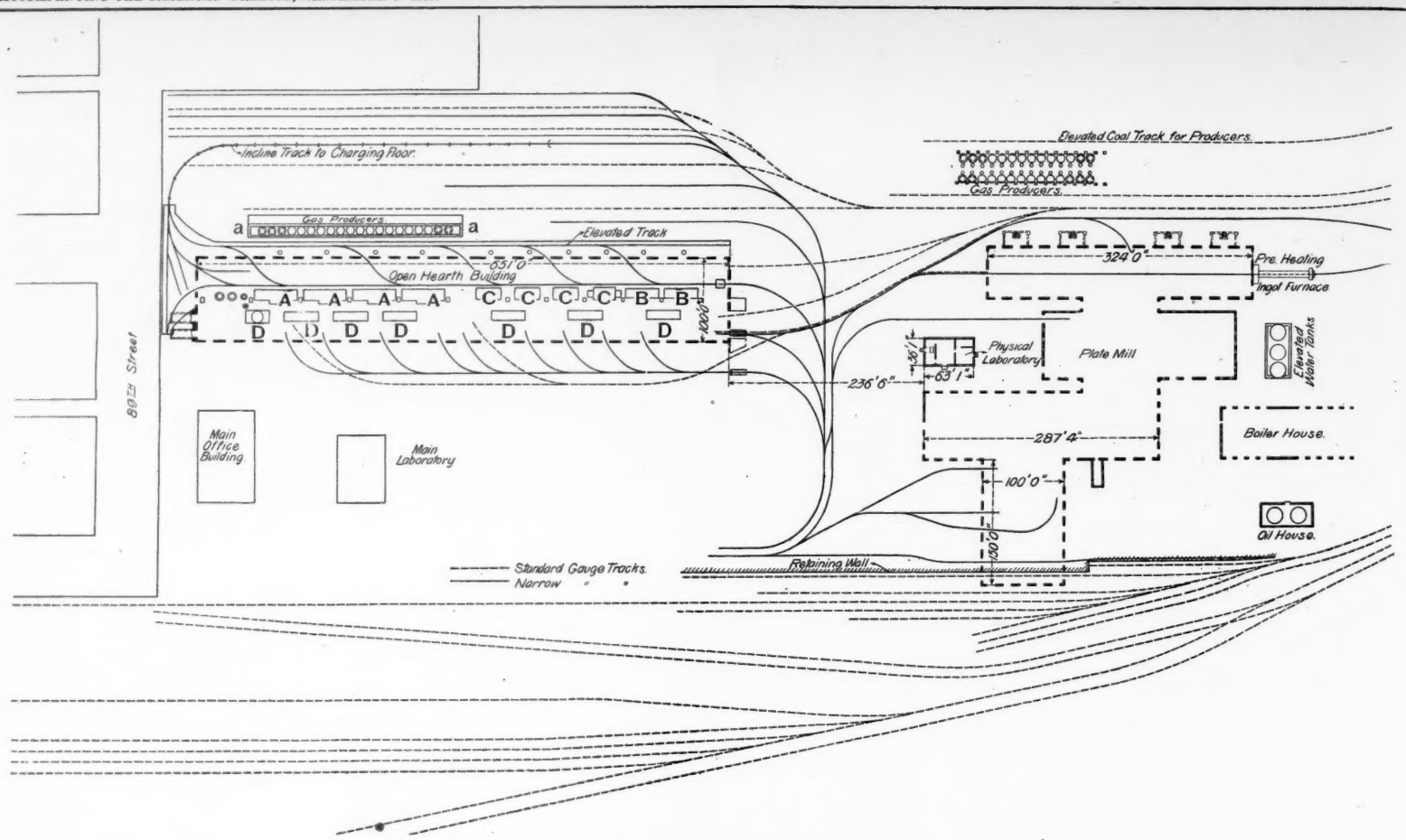
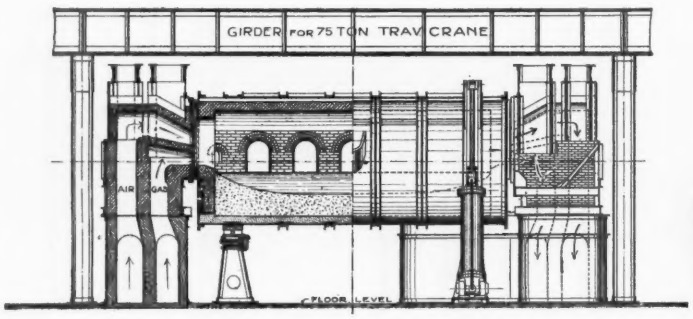
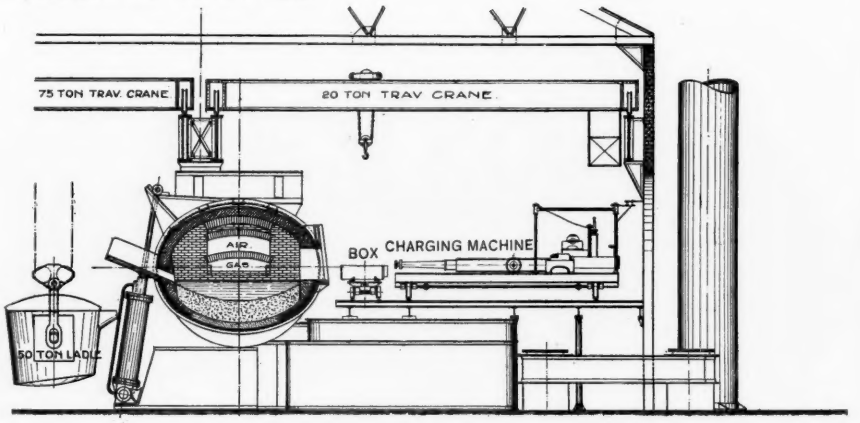


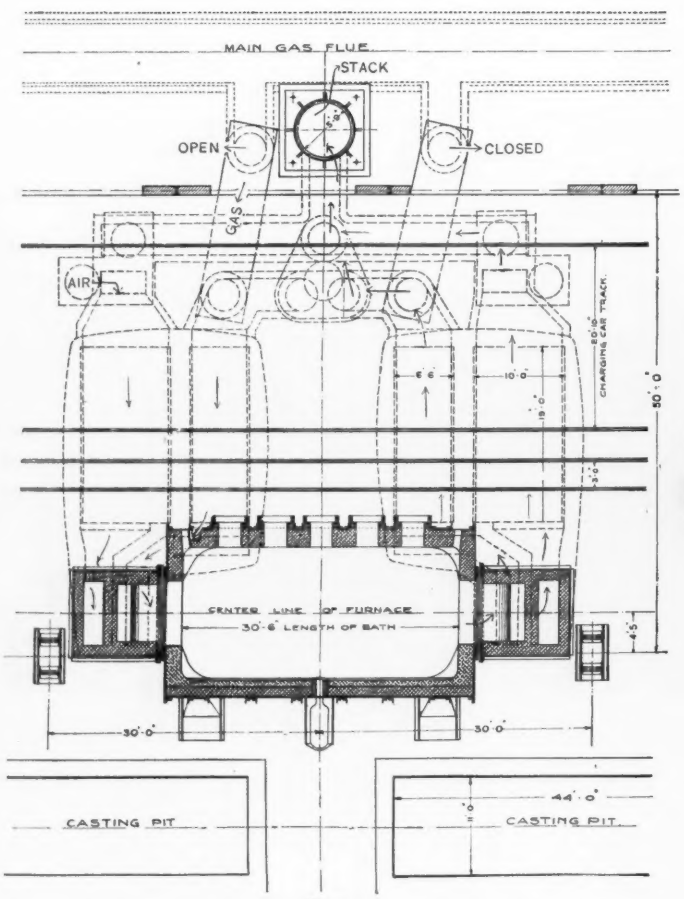
Fig. 2.—Plan of Open-Hearth and Plate Mill Plants.



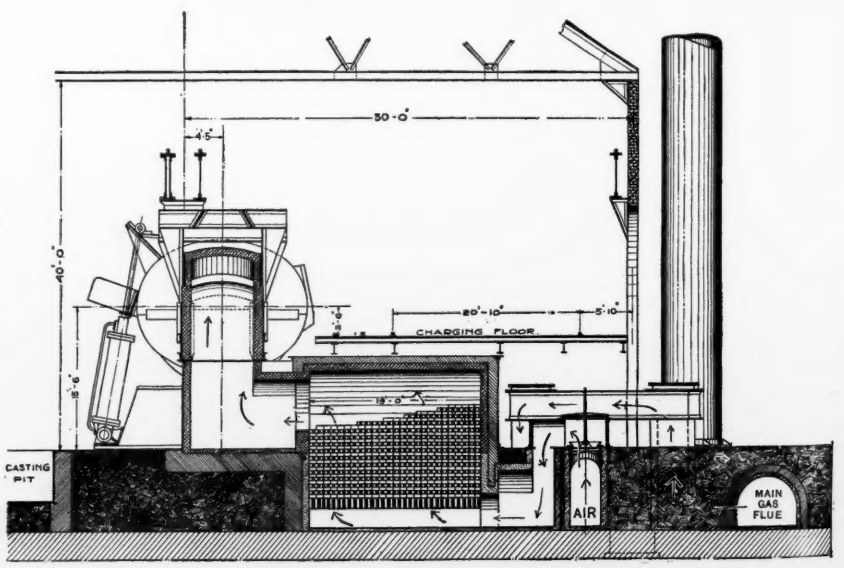
Longitudinal Section and Elevation.



Cross-Section through Center.



Plan.



Cross-Section through Port-End and Regenerator.

Fig. 3.—Fifty-Ton, Rolling, Open-Hearth Furnace.

THE OPEN-HEARTH DEPARTMENT AND PLATE MILL OF

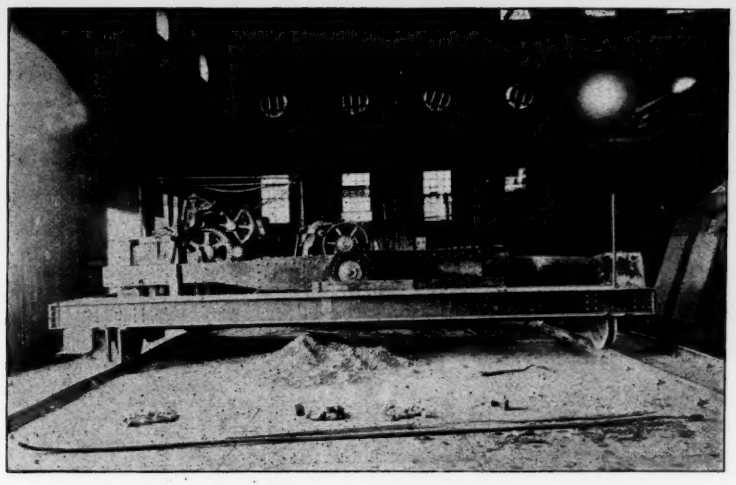


Fig. 5.—Wellman Electric Charging Machine.

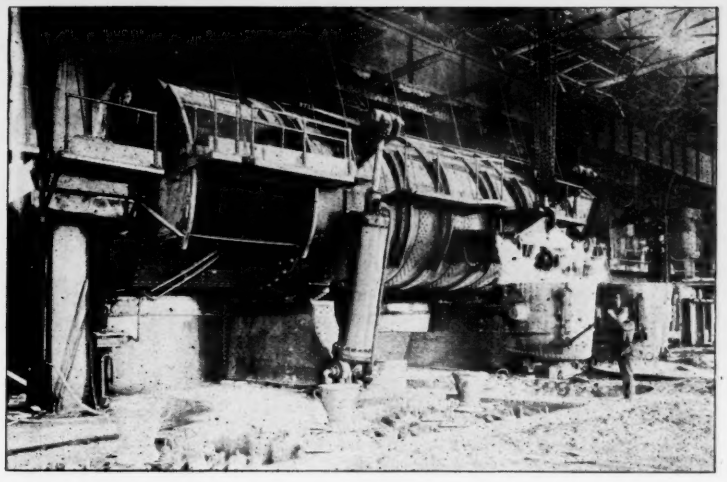


Fig. 6.—Tilting Furnaces.

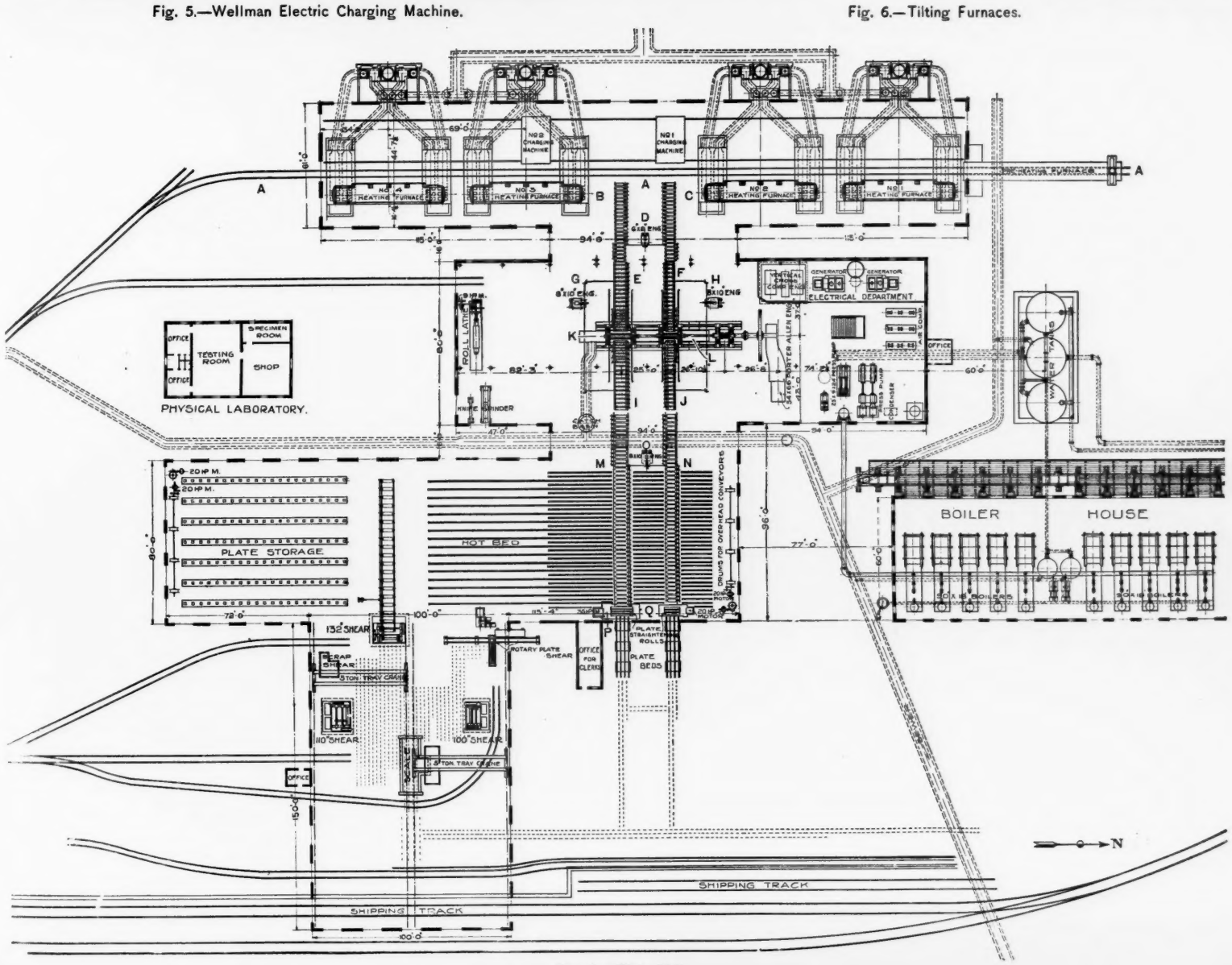


Fig. 4.—Plate Mill.

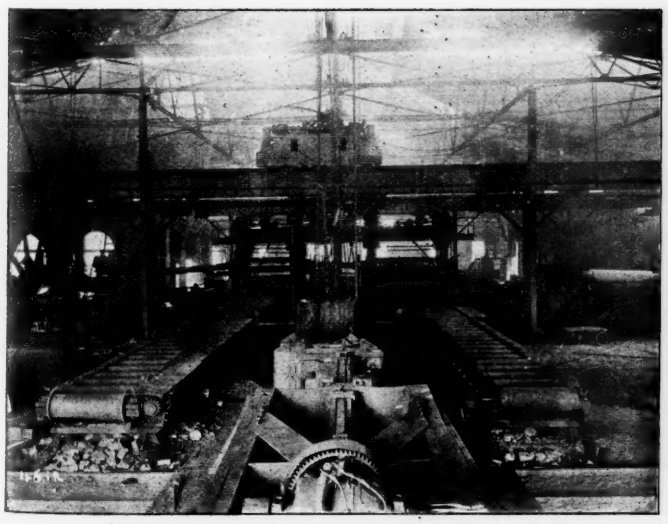


Fig. 7.—Plate Mill Roll-Trains.

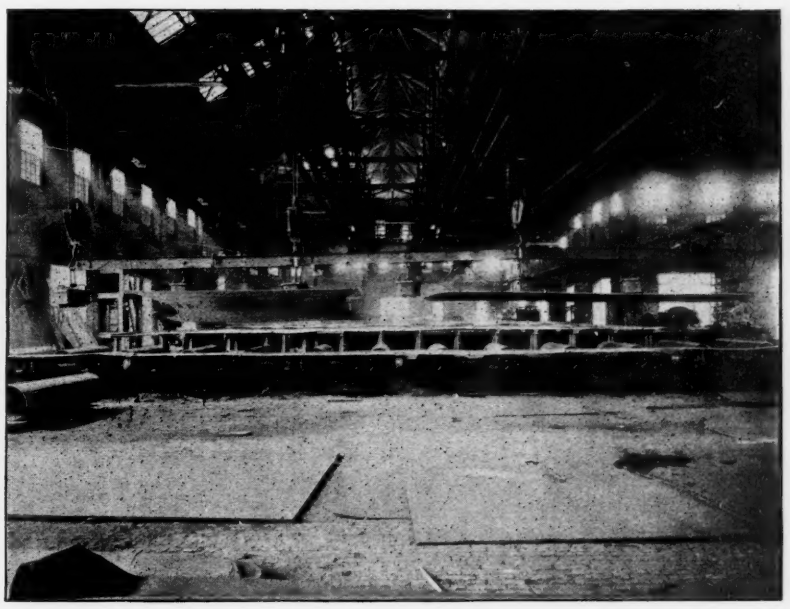


Fig. 8.—Electro-Magnetic Plate Conveyor.

than in any preceding year, as we have noted above. We append in tabular form the principal results of operation for three years:

	1896.	1895.	1894.
Miles of railroad operated	180,891	179,154	176,221
Revenue train mileage, thousands—			
Passenger	337,641	326,185	325,982
Freight	497,248	491,411	475,790
Mixed	15,785	15,458	15,381
Total	850,675	833,053	817,153
Freight ton-mileage, millions	93,886	88,568	82,220
Passenger mileage, millions	13,055	12,609	13,601
Freight earnings, thousands	$770,424	$743,784	$700,477
Passenger earnings, thousands	265,313	260,930	275,352
Miscellaneous earnings, thousands	89,895	87,681	91,114
Total earnings, thousands	1,125,632	1,092,395	1,066,943
Net earnings, thousands	332,334	323,196	317,757
Other income, thousands	104,008	113,768	96,159
Net income, thousands	436,341	436,965	413,916
Rentals, etc., paid, thousands	59,081	68,885	60,840
Interest on bonds, thousands	242,415	239,944	234,703
Other interest, thousands	7,996	8,192	7,445
Dividends, thousands	81,305	81,376	83,749
Miscellaneous payments, thousands	34,234	33,405	38,220
Total payments, thousands	425,032	431,802	424,687
Surplus, thousands	11,310	5,163	Def 10,770
Averages:			
Freight earnings per mile of road	$4,259	$4,151	$3,975
" " " ton mile, mills	8 21	8.39	8.64
Freight earnings per train mile	$1.55	$1.51	$1.47
Freight train load, tons	188.8	180.2	172 8
Ton miles, per mile of road	519,019	494,337	466,602
Passenger earnings per mile of road	$1,467	$1,456	$1,563
Passenger earnings, per passenger mile, cents	2.03	2.07	2.02
Passenger earnings, per train mile, cents	78 6	80.0	84.5
Train-load (number of passengers)	38.7	38 7	41.7
Length of each journey, miles	24.4	23.9	23.9
Passenger miles per mile of road	72,175	70,613	77,172
Total earnings, per mile of road, including miscellaneous	$6,223	$6,097	$6,054
Per cent. expenses	70.48	70.41	70.22
Interest, per cent	4.43	4.25	4.11
Dividends, per cent	1.54	1.59	1.64

July Accidents.

Our record of train accidents in July given in this number, includes 47 collisions, 97 derailments and 2 other accidents, a total of 146 accidents, in which 25 persons were killed and 116 injured. The detailed list, printed on another page, contains accounts only of the more important of these accidents. All which caused no deaths or injuries to persons are omitted, except where the circumstances of the accident, as reported, make it of special interest.

These accidents are classified as follows:

COLLISIONS.	Rear.	Butting.	Crossing and other.	Total.
Trains breaking in two	6	1	0	7
Misplaced switch	1	1	5	7
Failure to give or observe signal	0	1	1	2
Mistake in giving or understanding orders	0	1	0	1
Miscellaneous	4	3	4	11
Unexplained	8	0	11	19
Total	19	7	21	47

DERAILMENTS.			
Loose or spread rail	1	Too quick application of air brakes	1
Defective bridge	6	Runaway	2
Defective switch	1	Wind	1
Bad track	1	Landslide	1
Broken wheel	7	Washout	6
Broken axle	5	Sand drift	1
Failure of drawbar	6	Malicious obstruction	1
Broken car	1	Accidental obstruction	5
Failure of brake hose	1	Unexplained	43
Misplaced switch	2		97
Derailing switch	1		
Unfastened switch	1		
Bad switching	3		

OTHER ACCIDENTS.	
Boiler explosion	2
	2
Total number of accidents	146

A general classification shows:

	Collisions.	Derailments.	Other accid's.	Total.	P. c.
Defects of road	0	9	0	9	6
Defects of equipment	7	20	2	29	20
Negligence in operating	21	10	0	31	22
Unforeseen obstructions	0	15	0	15	11
Unexplained	19	43	0	62	41
Total	47	97	2	146	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other accid's.	Total.
Passenger	16	27	1	44
Freight and other	64	71	1	36
Total	80	98	2	180

The casualties may be divided as follows:

Killed:	Collisions.	Derailments.	Other accid's.	Total.
Employees	3	11	2	16
Passengers	0	0	0	0
Others	3	6	0	9
Total	6	17	2	25
Injured:				
Employees	19	35	2	56
Passengers	17	30	3	50
Others	3	6	1	10
Total	39	71	6	116

The casualties to passengers and employees, when divided according to classes of causes, appear as follows:

	Pass. Killed.	Pass. Injured.	Emp. Killed.	Emp. Injured.
Defects of road	0	15	2	7
Defects of equipment	0	3	2	4
Negligence in operating	0	17	3	19
Unforeseen obstructions and maliciousness	0	5	9	10
Unexplained	0	10	0	16
Total	0	50	16	56

Sixteen accidents caused the death of one or more persons each, and 39 caused injury but not death, leaving 91 (62 per cent. of the whole) which caused no personal injury deemed worthy of record.

The comparison with July of the previous five years shows:

	1897.	1896.	1895.	1894.	1893.	1892.
Collisions	47	35	33	61	89	83
Derailments	97	65	52	75	87	104
Other accidents	2	3	3	12	5	5
Total accidents	146	103	88	148	181	192
Employees killed	16	23	16	43	38	29
Others killed	9	79	9	21	22	16
Employees injured	56	33	48	95	79	77
Others injured	60	154	28	55	97	73
Passenger trains involved	44	33	27	60	55	82
Average per day:						
Accidents	4.71	3.32	2.84	4.77	5.84	6.19
Killed	0.81	3.29	0.81	2.06	1.87	1.45
Injured	3.74	6.03	2.45	4.56	5.68	4.84
Average per accident:						
Killed	0.17	0.99	0.28	0.43	0.32	0.23
Injured	0.70	1.82	0.86	1.01	0.97	0.78

Not a passenger was killed in a train accident in July, so far as we can discover. It is to be hoped that this favorable record will be continued many years, for in July, 1896, 75 passengers were killed, and a long-continued clear record of Julys will be needed to obliterate the disgrace of that record. The worst passenger train accident in July was that near Marietta, O., due apparently to the weakness of a bridge. Five other derailments are classed as due to bridge failures, four of them being explained, however, by the occurrence of floods.

Electric street railroads are to be charged with fatal injuries to nine persons in July. At Bay City, Mich., on the 7th, a car ran into an open draw and four passengers were drowned. At Pittsburgh there was a disaster on a hill injuring 25 or more, four, it is said, fatally. A car became uncontrollable by reason of the failure of a brake chain, but according to the reports this was not the immediate cause of the fatalities; these occurred in a following car which became uncontrollable from some other cause. There were seven other electric car accidents, the number of killed and injured in the whole nine accidents being 9 killed and 44 injured. The derailing of a freight car by a street car at Syracuse, in which case two passengers were injured, is reported under the head of railroad accidents.

Near Hinton, W. Va., on the 29th, a freight conductor was killed by gas in a tunnel. His train stopped for lack of steam, with the rear end in the open air; the conductor started from the caboose for the engine, but was overcome and was not found until the train had succeeded in getting through to the other side of the tunnel. Two brakemen were nearly suffocated.

Annual Reports.

Chesapeake & Ohio.—The annual report to June 30, 1897, advance sheets of which are at hand, shows that the development of the year has continued along the lines which we have been accustomed to note in this property. Its earning capacity has shown constant improvement each year and it is therefore in the expected nature of things to note a further increase of revenue over the 1896 totals, even though many railroads are reporting results about as bad as in any year of the recent depression. The Chesapeake & Ohio has had increases in both gross and net earnings, $487,000 and $164,000 respectively; 1896 had shown the highest net revenue in the company's history, but the 1897 totals for both gross and net are now much above any heretofore reported. The traffic statistics show that the already low rate has further declined to 4.19 mills; the noteworthy trainload has increased to 352 tons, a record quite beyond the trainload reported by any other company; tonnage has fallen off, but ton-mileage has increased, as well as train mile revenues. If the Chesapeake & Ohio could get the rates of other roads on the tonnage now carried (its ton-mileage being nearly up to that of the Lake Shore) or even the low rate of a few years ago, it would be one of the most prosperous roads in the country. Even with the present low rate, its affairs are in a satisfactory condition and if the revenue does not fall off, it seems quite probable that a dividend may be announced in the near future. The company has earned a surplus over all charges in each year since 1890, and in 1897 this surplus was $302,541. The results for the last three years are given below (length of road 1,276 miles):

	1897.	1896.	1895.
Gross earnings	$10,708,183	$10,220,131	$9,596,030
Oper. expen. and taxes	7,286,769	6,963,153	6,464,528
Per cent. expen. to earn.	68	68	67
Net earn	$3,421,413	$3,257,978	$3,131,502
Fixed charges less other income	3,118,871	3,110,637	3,112,796
Surplus	$302,541	$147,341	$18,706

The freight earnings, $8,389,000, were larger than ever before, but passenger earnings, $1,857,000, were affected by a falling off in local traffic. The details of operating expenses are given in the following table (cents omitted):

Expenses:	1897.	1896.	1895.
Maintenance of way	$1,366,185	$1,396,341	$1,195,903
" " equipment	1,477,268	1,427,694	1,327,173
Conducting transportation	3,048,176	2,939 505	2,785,736
General expenses and taxes	518,343	468,592	468,011
Traffic "	277,880	252,192	230,202
Newport News and Norfolk Terminals	439,933	317,663	295,984
Covington and Cincinnati bridge	158,981	161,163	161,496
Total expenses	$7,286,769	$6,963,152	$6,464,527
Net earnings	$3,421,413	$3,257,978	$3,131,502

It will be seen that all expenses are materially above the figures for 1895, and the saving in maintenance of way in 1897 as compared with 1895 is but $30,000. This account shows a decrease of $50,000 in the amount expended for bridge and building repairs, but an increase of $36,000 in cost of tie renewals. Rails cost more, but all the other changes are slight. The increase in equipment charges is due to the payment for new rolling stock. During the year six consolidation and four switching engines and 232 thirty-ton coal cars were purchased and charged to operating expenses. These replaced light engines and cars worn out, so that the equipment capacity has been increased to some extent. For instance, the freight cars broken up included 96 four-wheel coal cars, the last of the type on the road. The increase in the cost of handling transportation is due almost entirely to larger car mileage payments. This account nearly doubled; in 1896 the charge was $105,600; in 1897 it had grown to $204,000, or nearly four times the amount paid in 1895, when the item first appears in the reports.

Of course the company in these years has materially increased its need for freight cars. Tonnage has increased largely and ton-mileage about 289 million ton-miles. But in this period no additions have been made to the equipment, either motive power or cars, though the car capacity has been increased by substituting large for small cars.

The operations of the Chesapeake & Ohio are especially interesting because of the low cost of transportation which it has shown for some years past. It reports a heavier trainload and a lower average ton-mile rate than any other road, and there seems no probability that it will lose its pre-eminence in either respect. Since 1890 the company has improved its trainload 115 tons, or 50 per cent.; from 225 to 352 tons in 1897. The increase over 1896 is 27 tons. The Lake Shore, with its light grades, has an average trainload 30 tons less than the Chesapeake & Ohio, though the Lake Shore's average is of course much reduced by its large amount of branch traffic, while the Chesapeake & Ohio probably has a much smaller proportion of miscellaneous freight, which does not make such heavy carloads. We give below some of the heaviest trainloads reported:

	Tons.
Chesapeake & Ohio	352
New York Central & Hudson River	268
Great Northern	256
Lake Shore & Michigan Southern	322

The report for the New York Central is for the year to June 30, 1896, the latest published; for the other two roads, the year to Dec. 31, last. But the Chesapeake & Ohio trainload last year, 325 tons, is ahead of any other record.

Of course the company is favorably situated for heavy trainloads. The grades in the direction of heaviest traffic are descending, and its freight is mostly bulk traffic. Coal which is handled either to Cincinnati or to tidewater, and grain, which is carried long distances from the West for export give 50 per cent. of the total tonnage. Of the coal carried last year (3,398,000 tons) 1,034,000 tons was delivered at Newport News, 1,014,000 tons at Cincinnati and 538,000 tons were used by the company for fuel.

The changes in traffic in 1897 as compared with 1896 are not important. Corn tonnage was greater by 293,410 tons; coal carried fell off 309,454 tons, because the coal trade was demoralized throughout most of the year. The ton-mile rate on seaboard coal shows an improvement, increasing from 2.53 mills to 2.97 mills; the ton-mile rate on all traffic, however, fell from 5.39 mills to 4.75 mills. But in spite of this freight train earnings increased from $1.38 to $1.47 per mile. Tonnage carried decreased 53,583 tons, but ton-mileage increased 164,070,000 miles.

Since 1890, the year after the last reorganization, gross earnings have increased nearly a third, and the net have more than doubled. The increase in gross is $3,547,000, and in net the increase is $1,872,000. The increase in earning power per mile is even more noteworthy, and has steadily improved from year to year, as will be seen by the following table:

	Gross earnings.	Operating expenses.	Net earnings.
1897	$8,556	$5,875	$2,681
1896	8,016	5,457	2,553
1895	7,521	5,066	2,451
1894	7,076	4,716	2,360
1893	8,668	5,981	2,687
1892	9,068	6,779	2,289
1891	8.701	6,513	2,188
1890	7,559	6,080	1,479

Both gross and net have each increased $1,000 a mile in eight years; the percentages of increase have been 11¼ in gross and 37 in net. Of course, during this period there have been heavy charges to capital. The increase in interest charges is about $1,385,000, while in the same period net earnings increased, as stated above, $1,672,000, or about $287,000 more than the interest, which must be considered a satisfactory showing.

Denver & Rio Grande.—The annual report of the company for the fiscal year ending June 30, 1897, just at hand, shows that the company earned a surplus of $504,196 in the year's operations, after deducting interest, rentals and taxes. This was a decrease of $330,763 as compared with the surplus reported in 1896, and about the same as the 1895 surplus. It was sufficient to provide for the two dividends of one per cent. declared on the preferred stock, and to leave a balance of $31,196 against a similar credit in 1896 of $218,-

392. The earnings for the year were not only affected by the generally adverse conditions in the company's territory, but were further decreased by a prolonged strike in the Leadville mining district, lasting nine months. The result is seen in the heavy decreases in the year's revenue. Gross receipts fell off $611,724 to $6,996,797; gross earnings from traffic were $6,945,115, or $606,072 less than in 1896, equal to eight per cent. In working expenses there was a decrease of $273,444, or 6.29 per cent., while net earnings for the year show a loss of $332,628, or 16.39 per cent. The following statement gives a three-year comparison of the general results of working.

	1897.	1896.	1895.
Freight earn.	$4,894,612	$5,179,050	$4,819,905
Pass. earn.	1,247,991	1,478,911	1,183,270
Misc. earn.	802,512	893,226	913,665
Total	$6,945,115	$7,551,187	$6,916,840
Oper. expen.	9,075,336	4,348,780	3,991,212
Net earn.	2,869,778	3,202,406	2,925,628
P. c. expen. to earn.	58.68	57.59	57.70
Total income	$2,921,461	$3,259,740	$2,940,228
Fixed charges	2,417,265	2,424,782	2,411,538
Surplus	$504,196	$834,959	$528,690
Dividends	473,000	473,000	.....
New equipment	.....	143,568	.....
Balance	$31,196	$218,391	$528,690

It will be noticed that although the decreases in the revenue account in 1897 are large, as compared with 1896, the earnings are about up to those of 1895, when the company began recovering some of the great losses shown in 1894. In that year the company lost nearly a third of its gross earnings and more than that proportion of net. In 1895 the excellent recuperative power of the company was evidenced by gains of $440,000 in gross and of $442,000 in net. The 1896 report showed that the company had gained $634,000 additional in gross, or over $1,000,000 in the two years, and had also gained $277,000 in net, or $700,000 net in the two years.

Despite the considerable falling off in gross revenue in 1897, the officers of the road evidently strove in every way to keep the property up to the best possible condition, spending only about $273,000 less than in the previous year. Of the total reduction in expenses, $131,547 was in maintenance of way and structures, $45,563 in equipment repairs, and $86,287 in cost of handling traffic. But although something less has been spent on the roadway than in the year previous, some improvement in track is recorded. The tie renewals were in excess of the average of the last five years and cost $21,500 more than in 1896; 2,540 tons of new 85-lb. rail, purchased last year, were laid, and 7,500 tons additional, already contracted for, will go into the track this year, which will complete the work of laying the 25-lb. section between Colorado Springs and Pueblo. Two 10-wheel engines have been built at outside shops and paid for out of the special renewal fund, and two additional engines were built at the company's shops.

Of the $86,000 saved in the cost of transportation $22,000 was saved in car mileage, and $17,000 in outside agencies and advertising.

The freight train mileage was 2,373,302 miles, or five per cent. less than in 1896, while the revenue passenger train mileage was 1,779,501, or but two per cent. less than in the year previous. The Denver & Rio Grande annual reports, though notable for the excellent arrangement of all tabular matter, and the clearness and simplicity of all the facts and figures which are given, do not contain either the ton mileage or ton-mile rate. A classified statement of tonnage is presented. As compared with 1896 the most important increase was in precious ores, which increased about 37,000 tons or over 12 per cent. There were increases of 12,000 tons in grain and flour, and of smaller amounts in anthracite coal, hay and live stock. Heavy decreases were sustained in bituminous coal and coke, where 78,000 tons of freight was lost; lumber carried was 15,000 tons less; merchandise, 10,000 tons less. The most serious loss was in iron ore, where the falling off was 141,000 tons, or about two-thirds of the tonnage reported for this freight in 1896, while the revenue decreased from 10.5 per cent. to but 3.9 per cent. of the total freight receipts.

The Denver & Rio Grande still receives much more revenue from its traffic in silver ores than from any other single item of freight, $1,142,000 in 1897, as against $988,000 received from merchandise freight. In the last few years the proportion of the total revenue received from general freight has shown a steady improvement. In 1894 merchandise freight gave 17.7 per cent. of the total freight revenue, and in 1897 20.2 per cent., the actual increase in receipts being $188,000. The traffic statistics indicate that the tonnage is now more diversified than formerly. The gain in agricultural products carried is noticeable, especially grain and fruits. A comparison of the tonnage in 1897 with that of 1893, the year of the road's largest earnings, shows that the company is earning more proportionately from merchandise, lumber, bullion, live stock, fruits and grain, and less from coal and coke. Silver gives the same relative proportion of revenue, 23.4 in both years.

The general balance sheet shows no important changes from the previous year. The company now holds $559,000 of the bonds and stocks of the Rio Grande Southern in current assets against $369,405 in 1896. Comparing current items for the two years there is an increase of $82,516 in assets and of $87,186 in liabilities, but on June 30, 1897, current assets exceeded current liabilities by $1,908,496. The company has in its treasury, bonds and stocks aggregating at par $5,796,870, appearing on the books at $1,920,042, and addition it has in its Special Renewal Fund cash and securities at par $579,288, carried on the books at $439,466, total of all being at par $6,376,158.

NEW PUBLICATIONS.

Maximum Stresses in Framed Bridges. By William Cain, Professor of Mathematics in the University of North Carolina. New York: D. Van Nostrand Co., 1897. 16mo, 182 pages. Price, 50 cents.

The first edition of this little book, which now forms one of the Van Nostrand Science Series, was published in *Van Nostrand's Magazine* in 1878. It was then principally concerned with a comparison of the weights of bridges and their most economical depths, but bridges being now built on well-determined principles this discussion has been omitted and the book rewritten on a new basis. It has been the author's aim to prepare an elementary text-book on stresses in bridges by which the beginner may obtain the principles of design, and in this respect he has succeeded well.

A few of the most usual types of trusses are considered and the various methods of calculating the stresses produced by all possible loading are shown. The method of calculating stresses in web members by the method of moments is not, however, given; and though it may be supposed that the student is able to do this, the method having been used in determining chord stresses, it seems to us that as the book is intended for the beginner, it would be well to give a little more space to this important method. The subject of counter-bracing, that so often troubles the young student is treated at considerable length and so clearly discussed that no one should have the slightest difficulty in comprehending it.

In an appendix there is an interesting theoretical discussion of the most economical depth of trusses with parallel chords and a formula deduced by the application of which the required depth may be obtained. Numerous formulas for this purpose have been deduced, but this is the first one we have seen in an elementary work where the unit stress in compression members is not considered constant, but as varying with the length of the members divided by their radii of gyration.

Naturally it is impossible in so small a volume to give more than the first principles of bridge design, and for the student intending to make it a study it will only serve as an introduction to some of the treatises on that subject. But as in some of these the elements are as clearly set forth, or even more so, as in this little book, its usefulness will probably be limited. It will, however, be exactly what is wanted by those who wish to acquire the general principles of design with comparatively little study.

The Floods of the Mississippi.—Being an account of their principal causes and effects; a description of the levee system and other means of control, with an account of the great flood of 1897. By William Starling, M. Am. Soc. C. E., M. Inst. C. E., Chief Engineer Lower Yazoo Levee District. New York: Engineering News Publishing Co. Pamphlet; price, 50 cents.

Major Starling's pamphlet is a reprint of three papers which were published in January, April and July of this year in *Engineering News*. Major Starling describes the existing levees, the method of construction and of maintenance, and the casualties and dangers to which they are subjected. In another chapter he describes the floods of the Mississippi River, beginning with topography and geology of the basins and ranging over the subject in a broad and scholarly way. The third chapter describes the flood of 1897, its sources, the effect of the new levees on the flood heights and the effect of the flood on the levees. This chapter closes with a discussion of some of the various plans proposed for controlling the Mississippi. Altogether the pamphlet is a singularly interesting monograph and not the least of its attractions is that it contains a number of good pictures and diagrams.

The Timberman, in celebration of its eleventh anniversary, issues a special number of 198 pages, in gorgeous red covers. The lumber dealers of the country are very liberal in the amount of "copy" they furnish for the advertising pages, and we need hardly say that the greater part of this thick number is made up of advertising pages. It contains illustrated descriptions of the Lake Michigan Car Ferry Transportation Co., and of the monster car ferry steamship Pere Marquette, of the Flint & Pere Marquette Railroad. The article on the Lake Michigan Car Ferry states that lumber dealers find a saving of time by sending freight by that line.

The Mississippi Levees and the Flood.

(*Continued from page* 619.)

ing line, and that, while hundreds of miles of leevees were raised with earth and planks or sacks, the water at the highest stage of the flood did not really touch but a very small proportion of this emergency work. From this it plainly appears that these levee lines had a larger capacity for the control of this flood than that with which they were credited.

A system of levees that prevents overflow along 800 miles of river bank during such a flood as that now passing out of the water courses of the Mississippi Valley, that holds water 5 to 15 feet in depth, and often more, above the natural banks, and up to its very brim; that withstands the wear and strain of such a flood with a loss of only one-sixth of 1 per cent. of its length; that absolutely protects 85 per cent. of a territory containing an area of 15,000 square miles and property values of $180,000,000 against complete inundation, inevitable without it; that subjects the entire volume of such a flood to absolute control throughout a length of 330 miles of leveed water courses; such a system of levees surely cannot be charaterized as inefficient.

The Grades of the Levees.—But whatever may be concluded as to the effect of the crevasses which occurred during the late flood, there can be no reasonable doubt that had its volume been swollen by such quantities of water as have frequently come down the Red and the Arkansas in other flood years, the existing grade of the greater part of the whole levee line would have proved inadequate for efficient control.

Nothing, however, has been developed by the late flood to impair confidence in the sufficiency of the grades proposed by your committee on levees as stated in appendix 4, p. 3,461, "Report Mississippi River Commission," July 1, 1896. Practically this same grade was provisionally adopted by the Louisiana Board of State Engineers for levees below the head of Bayou Lafourche, as reported to the Mississippi River Commission in a letter of Aug. 22, 1896.

As a matter of course, it would be better economy to build at once to the still higher grades contemplated in the report of your committee referred to, should it appear that the available means and the time requisite for executing the work would warrant such an undertaking.

Proper Cross-Section.—As to the form of cross section best adapted to fulfill the purposes for which levees are designed, it can hardly be said that anything new has been demonstrated by the experience of this flood.

That form of embankment that will best retain its shape when completely saturated with water, still seems the best and safest. As the lower portions of a levee are generally less dry than the upper parts, there may be reason in giving the section flatter slopes toward the base than near the top; but generally speaking the form of section having a bench or "banquette" on the land side seems to serve all the purposes of a flattened slope, and, indeed, approaches the usual form naturally taken, when it sloughs down and comes to rest in a position of stable equilibrium. Moreover, such banquettes may generally be easily added to existing levees without the danger of serious sloughing during high water, which always, in some degree, attends the enlargement of a levee by adding to its comparatively steep land side face a thin wedge of earth, though of considerable flatter slope.

Levees built of almost any sort of earth with side slopes of one on three have generally stood without any sloughing of consequence wherever the seepage water was well drained away from the base, but where drainage is deficient, and also where the soil appears excessively loose and friable, the addition of a banquette, or construction with a flatter land side slope, is found to give stability.

The width of crown may properly vary according to the degree in which the levee is exposed to the washing of waves and with the friability of the soil, also to some extent with the height; but, in general, a width of 10 or 12 ft. seems sufficient. The practice of raising the middle of the crown considerably above the edges has the advantage of shedding rainwater promptly, and thus preventing the formation of gullies down the sides; but it is open to question whether it does not also somewhat retard the settling together and solidifying of the embankment, which it is desirable to have take place as early as possible.

Allowance for Settling.—The proper allowance to be made for the settling of subsidence of embankments is a fruitful source of disagreement between engineers and contractors. The Louisiana practice for a number of years past has been to make it a matter of contract that a "net cubic yard of solid earth, equal to five-sixths of a gross cubic yard of loose earth," is the unit of measurement. This definition of the cubic yard was adopted at a time when most of the levee work was done with wheelbarrows, and there has been very little room for disagreements as to its meaning. But since the use of teams and scrapers has become general, many contractors appear to think the requirement excessive. It has not been discovered, however, that any difference in the prices bid is made between work done under such a requirement and that done under those which only exact an excess of one-eighth or one-tenth over net measurements as an allowance. Hence, it is thought that nothing could be gained to the public by changing this requirement to conform to the practice which appears to have become pretty general elsewhere. Levees built with scrapers certainly sometimes settle more than one-eighth, and if one-fifth in excess of the net measurements were always required, levees would certainly be somewhat higher, and apparently at no cost to the public.

Maintenance.—A few facts connected with levee construction and maintenance, though by no means new, may be mentioned as having been emphasized by the experience of this flood, such as the danger, more than ever apparent this season, that earth added to levees in enlarging them on the land side may slough and slide down during high water or whenever it is first thoroughly saturated, even if that condition is delayed for years, and the consequent importance of placing all levee enlargement, except that in form of "banquettes," on the river side wherever practicable; the importance and value of good drainage as a means to prevent sloughing and to dislodge or at least discourage the depredations of burrowing animals, and the fact that to stop leakage or excessive seepage, in fact, for almost any other purpose with which earth is added to levees—one spadeful of earth on the water side of the levee is worth dozens placed on the land side.

The only recommendations I can make at this time are that gaps in the line be closed and the work of enlarging the levees throughout the alluvial valley to higher grades and stronger sections be carried on as rapidly as means therefor can be made available, and that in the interests of Louisiana the lines be extended up Amos Bayou, in Arkansas, down the Mississippi, left bank, below Bohemia, and especially down the right bank below Bougère Landing.

Locomotive Counterbalancing and Its Effects.*

BY A. H. ANGIER.

Engineering Staff, Chinese Eastern Railway, St. Petersburg.

(*Concluded from Page 584.*)

DISTRIBUTION OF THE COUNTERWEIGHT.

As has already been remarked, we can concentrate the counterweight for the reciprocating parts in the main driving wheels, or, what is better, it may be distributed

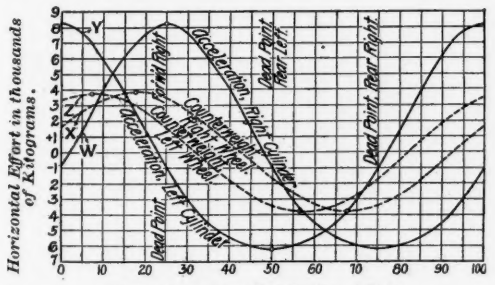


Fig. 11.

between them and the coupled wheels. It is, in fact, a matter of indifference whether the counteraction of the surging efforts is applied directly in the driving wheels or several feet distant. In Europe the first method is used, and in America the second.

At first sight it would seem that the former method was the correct one, and that it would hardly be proper to give to the other wheels the inevitable hammer blow resulting from the counterbalance of the reciprocating parts. On the other hand, by admitting this hammer blow to all of the other wheels we shall be able to balance a larger portion of the reciprocating masses, thus diminishing the surging and swaying efforts. Again, the most irregular tire determines the date of returning all upon the engine, and irregularity of wear, other things being equal, is greater as the hammer blow of the wheel is increased. There is then no practical disadvantage in having all of the tires reach a condition where they need turning at the same time, whence we conclude that: "For the same proportion of balance of the reciprocating masses, the distribu-

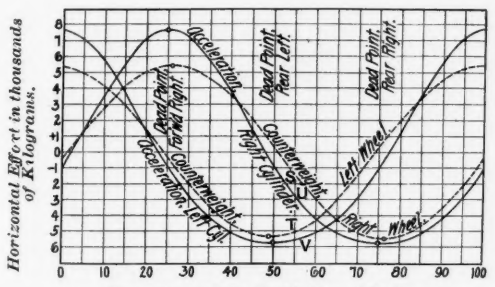


Fig. 12.

tion of the corresponding counterweight among several pairs of wheels has the advantage of reducing the hammer blow and consequently the irregularity in the wear of each of them."

Or rather:

"For a pre-determined vertical disturbance in each pair of wheels, this distribution of the reciprocating counterweight permits a larger portion of the corresponding masses to the balanced, and thus insures a smoother running of the engine."

We may, therefore, assert that American practice rationally applied is preferable from every point of view to the general European method. We can, however, unreservedly condemn another American practice, which consists of making an even distribution of the whole counterweight, including the partial rotary counterweight among all of the wheels. By thus ignoring the constructive differences of the driving wheels we necessarily give a heavier blow to the track as well as cause a greater irregularity in the wear of the tires.

PROPORTION OF RECIPROCATING MASSES TO BE BALANCED.

The practice of builders in this matter will be found to be quite variable and subject only to arbitrary rules. In express engines it is customary to balance from 25 to 67 per cent. of the reciprocating masses, while in freight engines this proportion rises to 80 per cent. and is occasionally even more than 100 per cent., results which naturally follow an unintelligent application of the rule of thumb. In fact complete confusion reigns regarding this point, the only thing is that there is a tendency upon high-speed engines to balance a smaller portion of the reciprocating masses. This practice is caused by the desire to avoid exaggeration of the vertical efforts, resulting from the centrifugal force of the reciprocating counterweight at high speeds. This leads us to the following rule: "Cal-

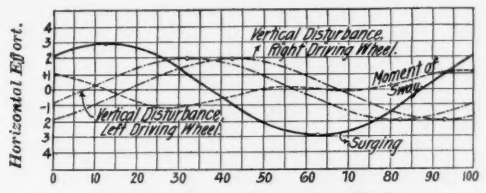


Fig. 13.

culate this proportion so that the vertical disturbance in each driving or coupled wheel, at the maximum predetermined speed, shall not exceed a prescribed fraction of the static load."

This calculation is an easy one if it be remembered that the rotating masses and their counterweights exactly balance and do not enter into the calculation at all.

Let T be the normal or static load to be considered and kT the maximum admissible vertical disturbance. We at once deduce from the well known expression for centrifugal force:

$$kT = C \times 0.0000112\, R\, N^2.$$

giving

$$C = \frac{89{,}300\, kT}{R\, N^2} = 0.316\, \frac{kT}{R} \left(\frac{D}{V}\right)^2 \qquad (11)$$

which is the admissible reciprocating counterweight for this wheel, R being the radius of the driving crank and D the diameter of the driving wheels in centimeters, V the speed in kilometers per hour, and N the number of turns of the wheel per minute.

Converting these equations to English measurements we have

$$kT = C \times 0.0000284\, R\, N^2$$

giving

$$C = \frac{35.211\ kT}{R\, N^2} = 0.312\, \frac{kT}{R} \left(\frac{D}{V}\right)^2$$

in which R is the radius of the driving crank, and D the diameter of the driving wheels in inches. V the speed in miles per hour and N the number of turns of the wheel per minute. This calculation should be repeated for each pair of wheels, always keeping their respective loads in mind, by which means we will obtain a second, third, etc., reciprocating counterweight.

All of these partial counterweights have the same direction, that of the angle of deviation ρ, independent, as we have seen, of the absolute weight of the reciprocating parts, and by adding them together, we obtain the total reciprocating counterweight. By substituting the value thus obtained in formulæ 5 or 7 we obtain the total balanced weight of the reciprocating masses of the corresponding cylinder. It is to be understood, as before, that the weights referred to any cylinder are reduced to the radius of the driving crank.

It may happen that we are enabled to balance more than the total of the reciprocating masses, or we may not be able to balance a sufficient proportion dependent upon the limits of vertical disturbances that have been imposed. So the conditions may be modified in order to suit the case in hand, and for practical reasons it is possible to divide the quota of the coupled wheels equally among themselves, especially as there is no great difference in their normal loads. We should, however, give the driving wheels the proper proportion which belongs to them, since these wheels are not interchangeable with the others on the engine. The proportion of reciprocating masses to be balanced in each wheel, being *rigorously defined*, it is only necessary to enter these values in the formulæ in order to make the calculations. In this way we shall substitute a method of calculation adapted to the pecularities of each case for the arbitrary valuations now in use.

The author is of the opinion that it is better to work in accordance with the method laid down than to distribute the reciprocating counterweight equally among all of the wheels, including the main drivers, since the latter are influenced less by the galloping tendency of the counterweight than the wheels at the ends.

In order to thoroughly appreciate the different elements of the problem, let us apply the principles which we have just discussed to two engines of the same class, but with inside and outside cylinders. Let us choose for this purpose express locomotives, with a bogie truck and four wheels, coupled, with horizontal cylinders, and, in the case of the inside cylinders, with the driving and coupling cranks opposite. Let us admit that the reciprocating counterweight of each engine is to be proportionately distributed between the two pairs of wheels, that the maximum velocity is to be 300 revolutions per minute and that the vertical disturbance upon each wheel of the first engine is not to exceed 20 per cent. of the normal weight upon that wheel. Finally, let us prescribe that the same percentage of the reciprocating masses must be balanced in each engine, and then let us determine the counterweights and the surging and swaying forces in each engine.

LIST OF DIMENSIONS.

	Engines with Cylinders.	
	Inside.	Outside.
Diameter and stroke of pistons	19½ in. × 25½ in.	19½ in. × 25½ in.
Diameter of driving wheel	7 ft. 3 in.	7 ft. 3 in.
Length of connecting rod	7 ft. 3 in.	7 ft. 3 in.
Normal load on main driving wheels	42,990 lbs.	42,990 lbs.
Normal load on coupled driving wheels	40,792 "	40,792 "
Weight of reciprocating masses	485 "	450 "
Weight of rotating masses, driving cranks	860 "	211 "
Weight of coupled masses, driving wheels	361 5 "	469,5 "
Weight of coupled masses, trailing wheels	361.5 "	436,5 "
Distance from center to center of cylinders 2 K	1 ft. 9 in.	6 ft. 6 in.
Distance from center to center of counterweights 2 L	5 ft.	5 ft.
Distance between coupling planes (previously defined) 2 M	6 ft.	6 ft.
Distance between coupling planes (previously defined) 2 N	....	6 ft. 3 in.

Remark.—In the engine with outside cylinders the two cranks on the same side are taken as being the coupled parts.

In making successive calculations of the forces causing a vertical disturbance at a given speed, the reciprocating counterweights of each pair of wheels, the corresponding proportion of the reciprocating masses, and,

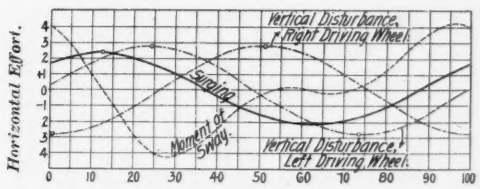
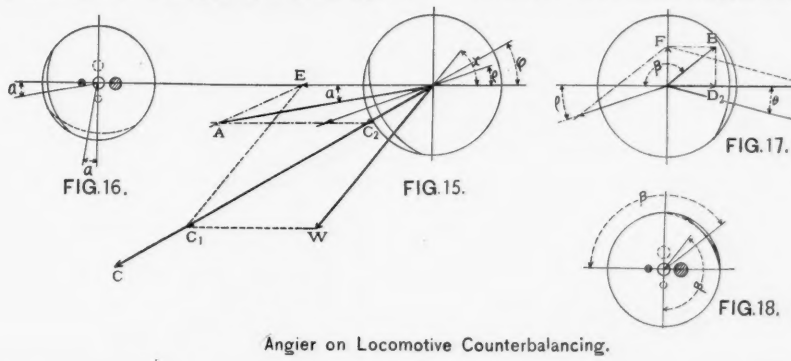


Fig. 14.

finally, the total counterweights, we obtain the following results (the weights being reduced to the radius of the cranks, which, for the sake of brevity, are put in the form of a table:

	Engines with cylinders.	
	Inside.	Outside.
Vertical centrifugal effort in one main driver	4,299 lbs.	6,129 lbs.
Vertical centrifugal effort in one coupled driver	4,079 "	5,821 "
Ratio to the normal load on the wheels	20%	28.5%
Reciprocating counterweigh', main driving wheel	131 lbs.	187 lbs.
Reciprocating counterweight, coupled driving wheel	135 "	178 "
Reciprocating counterweight, total	256 "	322 "
Corresponding weight of reciprocating masses	342 "	317.5 "
On a proportion of reciprocating measurer	70.6%	70.6%
Total counterweight, main driving wheel	479.5 lbs.	958 lbs.
$t\,g\,\varphi$	1.212	− 0.1148
Total counterweight of coupled wheel	294 lbs.	672 lbs.
$t\,g\,\mu$	− 0.307	− 0.1136

It will be noted that the reciprocating counterweights



Angier on Locomotive Counterbalancing.

for the engine with outside cylinders, for the same proportion of corresponding masses balanced are much heavier than with the inside cylinders, and that the corresponding vertical disturbances are 40 per cent. greater than they are in the inside engine. It is the inevitable consequence of the greater distance between cylinder centers.

* Translated from the French as published in the *Revue Generale des Chemins de Fer*, June, 1897.

We now pass to the remaining forces that cause surging and swaying, remembering that the rotating masses and their counterweights have no influence upon the production of these effects.

Let us suppose that the counterweights placed in the two engines coincide in size and direction with their calculated values and that the effective weights of the parts of the mechanism are those used for the purpose of making the calculation. We take, as before, a speed of 300 revolutions per minute or 77.65 miles per hour; the acceleration at the dead points, front and back, of the reciprocating masses will amount to 18,990 lbs. and 13,583 lbs. for the first engine and 16,904 lbs. and 12,538 lbs. for the second.

Let us make acceleration diagrams for the two cases, taking equal portions of a revolution of the wheel as abscissas and the acceleration causing surging toward the front as positive ordinates. In supposing that the crank under consideration is the one on the left, the summit of the acceleration curves of the right will be placed one quarter of a turn from the same point for the left. We may also trace the curves representing the horizontal component of the centrifugal force of the partial reciprocating counterweight, $C + C^2$, the main and trailing driver, respectively, superimposed upon it. We can determine the centrifugal effort which directly resists the acceleration of the reciprocating masses of the alternate cylinder by taking the angular position of the right and left counterweight into account.

Figs. 11 and 12 show the acceleration curves and the countersurging forces thus obtained for the inside and outside engines, respectively. These forces act in different planes; their algebraic sum, at any point of rotation, constitutes the surging effort; the algebraic sum of their moments, taken relatively to the center line of the engine, gives the moment causing swaying at the given instant.

These values are easily determined from the diagrams of the dynamic efforts. The surging effort is given by the ratio: (acceleration — reciprocating counterweights) left + (acceleration — reciprocating counterweights) right. For example, in order to obtain the abscissa .05 of Fig. 11, it is only necessary to make an algebraic addition of the lengths YZ and WX. The forces of positive surging work in the direction of the front of the engine and *vice versa*.

The expression for the swaying moment is: acceleration (left — right) × K — reciprocating counterweight (left — right) × L. For the abscissa .05, for example, in Fig. 12 this moment is $UV \times K - ST \times L$. The positive moments falling above the axis of abscissas tend to turn the front of the engine to the right, and *vice versa* for the negative moments.

Figs. 13 and 14 show the results as thus calculated for the two numerical examples that have been chosen; they also contain the curves of vertical disturbances which occur in the driving wheels of the two engines. An examination of these curves leads us to the conclusion:

(1) That taking the distribution of the reciprocating counterweight between the main driving and coupled wheels to be proportional to their normal loads, a well-designed mechanism and inside cylinders as close together as possible, we shall obtain a locomotive that runs very smoothly and which will put but little stress upon the rolling stock or track, even at high speeds.

(2) All things being equal, the use of outside cylinders has the advantage of a smaller surging force, but causes *three times* the amount of swaying, and vertical disturbances that are 40 per cent. greater than those obtained with inside cylinders.

These results give a ready explanation of the well-known superiority of inside cylinders, when taken from the standpoint of ease of running and decreased stress upon the track and permanent structures at high speeds. It also enables us to arrive immediately at the following conclusions:

To obtain an engine that shall run as smoothly as possible from the standpoint of the efforts due to the inertia of the masses, it is necessary:

(1) To use inside cylinders placed as close together as possible.

(2) To reduce the weight of the reciprocating parts to the lowest possible point, by the use of strong metals and a well-designed construction.

(3) To distribute the partial reciprocating counterweights between the main driving and the trailing wheels, in proportion to their normal loads.

(4) To balance the reciprocating masses as completely as possible, while adhering to the condition that the over and underloading of each wheel, at the prescribed maximum speed, shall not exceed a predetermined fraction of its normal pressure upon the rail.

(5) To avoid overhanging parts, to give the engine as long a wheel base as possible, using, if it can be done, a bogie and raising the center line of the boiler.

The dynamic curves which we have drawn have a genuinely practical interest; they are, in fact, the backbone of the general construction of the engine and the proper balancing of the masses.

There are two points that still remain to be examined; the movements of inertia of the engine and the application to existing engines of the methods that have been here laid down.

The surging effort is, perhaps, the most disagreeable to passengers, but least injurious to the track. It is evident that it will make itself felt in an inverse ratio to the total weight of the engine, all other conditions being the same; hence we can balance a smaller proportion of the reciprocating masses with a very heavy engine, than when the contrary is the case, without injury to the smooth running of the locomotive. Furthermore, as the surging effort changes its sign twice for each revolution of the wheel it follows that, at high speeds, the corresponding motion will disappear with one exception: at the critical speeds, where the changes are in exact accord with the vibrations of the engine. In other respects it follows the general rule of reciprocating efforts.

Exactly the same thing occurs in the case of the swaying motion, we simply remark that the curious form of the swaying curve can be readily confirmed by the amplitude of the sinuous movements of unsteady engines at low speeds. The overhang of outside cylinders and the firebox combined with a short wheelbase aggravate the disagreeable effects of the swaying; on the other hand, the use of the bogie truck, and especially with a radial attachment, is an excellent means of diminishing this effect. The latter is, in fact, equivalent to a sort of lateral brake to check the side motion of the engine.

Rolling and galloping are accidental motions due to the obliquity of the connecting rods and the variations in the steam pressure; but, because of the infinite number of variables which give rise to them, their calculation is a very complicated matter, if not quite impossible. We shall merely remark that, by increasing the moment of inertia of the engine, relatively to the rails, or by raising the boiler, we effectively remove the rolling movement.

The application of the present methods to the study of the conditions of equilibrium of existing locomotives presents no difficulty whatever. The data of the problem are: the weights of and distances between the various parts, the size and direction of the existing counterweights.

Let us suppose the case of an engine with inside cylinders, whose driving and coupled wheels (left side) are shown by Figs. 15 and 17. The actual counterweights C and D are there indicated in size and direction. We find the rotative counterweight W for the driving wheels, its angle of deviation λ as well as the angle of deviation ρ of the reciprocating counterweight. We decompose W between φ and the horizontal; the portion C_1 of the actual counterweight is replaced by W and the horizontal component E. Let us bring the rest of the actual counterweight C_2 back to the center of the wheel and compose it with E; there then only remains in the wheel the unbalanced resultant A of these two forces, and the rotating counterweight W, which is eliminated with its corresponding masses. We may remark that the intersection of the straight line $C_2 A$ and the direction ρ gives the weight of the alternating partial reciprocating counterweight at once; starting from the so-called equilibrium of the reciprocating masses. We do the same thing for the coupled wheels (Fig. 17) by obtaining in like manner a second, third, etc., unbalanced force.

We add or compose these forces, according as their angles of deviation α, β, etc., are identical or differ, and the single resultant Z, used as a trace of the curves of counter-surging, permits us to calculate the diagrams for surging and swaying as before. The unbalanced resultants A, B, etc., taken separately, give by the well-known processes the curves corresponding to the vertical disturbances.

This analysis is very simple and permits us to obtain an exact account of the effects of a faulty arrangement of the counterweight, either in size, direction or distribution. The most common defect consists in locating the counterbalance in a line of the crank prolonged, ignoring the fact that each wheel really contains two counterweights belonging to the organs of the respective cylinders of the engine, and that the angle of deviation is a necessary consequence of their composition. We see, for example, by referring to Figs. 15 to 18, that the hammer blow effects A and B have a direction quite different from that of the angle ρ along which they ought to be in a well-designed machine. It is simply important to recollect that in determining the surging and swaying forces we superimpose or compose the hammer blow of each pair of wheels, while we consider them separately in calculating the vertical disturbing forces.

TECHNICAL.

Manufacturing and Business.

The Standard Railroad Signal Co., of Arlington, N. J., has received a contract from the Erie Railroad to furnish two 40-lever interlocking machines and two 8-lever machines for Rutherford Junction and Berry's Creek, one 40-lever machine at the Hackensack drawbridge and a 32-lever machine for Forest Hill Junction, with appurtenances.

The reorganized Conshohocken (Pa.) Tube Works Co. resumed work Aug. 30. It is stated that the company has assurance of sufficient work to keep the factory running steadily some months.

The plant of the Anniston Pipe & Foundry Works, of Anniston, Ala., was burned Aug. 29; estimated loss, $100,000, partly covered by insurance. The plant employed 600 men, and was turning out about 500 tons of pipe a day. It is understood that the plant will be rebuilt at Birmingham, so as to be nearer the raw material field and where better transportation facilities can be had.

On Aug 25 Judge Putnam, of the United States Circuit Court for the District of Massachusetts, rendered a decision in favor of the complainant, with an order for an injunction and accounting, in the suit of the Consolidated Car-Heating Co., of Albany, against the American Electric-Heating Corporation and the West End Street Railway Co., of Boston. This is the suit for the infringement of the patent to James F. McElroy, covering the Consolidated Car-Heating Co.'s spiral coil construction of electric heaters, which is now used in the majority of street cars that have electric heaters.

The Bucyrus Co., South Milwaukee, Wis., has recently furnished six steam shovels to the Northern Pacific Railroad. This company has been working its entire shops 24 hours a day for some time, on account of the large amount of work on hand.

The Fay & Egan Co., of Cincinnati, O., reports a decided improvement in business. Recent orders include a number of machines for the Perth and Farnham shops of the Canadian Pacific; nine machines for the government for Port Royal, S. C., and several machines for the Pennsylvania Railroad and the Oahu Railroad & Land Co. of Honolulu. The company is also filling an order for some tools for car works for the Russian government.

New York and Boston are vying with each other in prouiding fast mail transportation and are hurrying the work on the pneumatic tubes of the Batcheller rapid postal dispatch which has been adopted. The New York plant is to have two air compressors, with steam cylinders of 13 in. diameter and air cylinders 26 × 20 in., and one compressor with cylinders 10 in. and 24 in. diameter, respectively steam and air, by 20-in. stroke. In Boston there will be two air compressors of the latter size. All five compressors are to be "duplex," and the Rand Drill Co., of 100 Broadway, New York, has the contract for making them.

The R. D. Nuttall Co., of Allegheny, Pa., makers of electric railroad appliances, is preparing for an increased fall business and has bought a new bevel gear planer made by the Gleason Tool Co.

The attachment obtained Aug. 28 against the firm of Levering & Garrigues, iron contractors, of 552 and 554 West Twenty-third street, by George Toplitz on an assigned claim of the receivers of the Pottsville Iron & Steel Co. for $9,127 for material furnished for the Brooklyn Bridge, was discharged Aug. 30, proper bonds being furnished. The attachment was obtained on the technical ground that neither member of the firm was a resident of New York state.

The Buffalo Bolt Co., of Buffalo, N. Y., has been incorporated with a capital of $500,000 to make nuts, bolts and screws and bolt and nut-making machinery. The directors are Ralph H. Plumb, Robert C. Board and Herbert H. Hewitt, of Buffalo.

The Valdosta Foundry & Machine Co., of Valdosta, Ga., is in the market for a boiler punch and shear combined, with not less than 36-in. throat and strong enough to punch ⅞-in. holes in ½-in plates.

Iron and Steel.

The Phœnix Iron Co., of Phœnixville, Pa., is dismantling its blast furnace at that place, which has been idle for the past 10 years.

The plant of the Michigan Iron Works, at Manistee, Mich., which has been idle for a number of years, has been leased by Fitzgerald & Meyer and work has been resumed.

The Washington Sheet & Tin Plate Mills, at Washington, Pa., started work on full time last week. During the past two months the capacity of the mills has been doubled. An extension of 120 × 100 ft. was added to the rolling mill. A new wareroom 100×40 ft. and a tinning-house 40 × 60 ft. were built, and a new 400-H. P. engine with a 32-ft. fly-wheel has been placed in the new part of the plant, and also a train of rolls duplicating the former train. The plant is now a nine-mill plant.

The Spearman furnace at Sharpsville, Pa., was put in blast Aug. 30, and the Claire furnace, owned by M. A. Hanna & Co., of Cleveland, is scheduled to start next week, and the Alice, owned by Pickands, Mathers & Co., of Cleveland, the week following.

The Whittaker Iron Co., of Wheeling, W. Va., has placed an order with the Ætna Foundry & Machine Co., of Warren, O., for doubling and squaring shears for its new mill.

The property of the Etna Iron Works at Ironton, O., will be sold by the trustees, Messrs. Clark and Lee, of Philadelphia, Pa., Sept. 25.

Eight puddle furnaces of the Ellis & Lessig Steel & Iron Co., of Pottstown, Pa., resumed work Aug. 30.

The Midvale foundry at Allentown, Pa., will be enlarged by the addition of a pattern shop 50 × 100 ft. and an annex to the foundry of 68 × 100 ft.

New Stations and Shops.

Plans are being prepared for enlarging the Union passenger station in St. Paul. The improvements, in addition to increasing the general facilities, will afford room for handling all baggage business in one place instead of part in the main building and part in the separate building some distance away, as at present. The room gained by removing the separate building will be used for additional tracks and train shed.

The contract for building the new passenger station of the Chicago, Milwaukee & St. Paul on Fourth street, between First and Second avenues, Cedar Rapids, Ia., has been awarded to L. Wallace & Son, of that city, and it is expected that the work will be finished in November. The building will be 40 ft. × 140 ft., two stories high and cost about $30,000.

The contract for the superstructure of the new freight-house of the Pittsburgh & Lake Erie at Pittsburgh has been awarded to the Schultz Bridge & Iron Co., of McKees Rocks, Pa., at about $50,000. The building will be 200× 407 ft., with a steel frame. The foundation has been finished, and it is expected that the building will be completed within two months. The road expects to build a new train shed at Pittsburgh in the near future.

The officers of the railroads centering in East St. Louis, Ill., after consultation with the municipal officers and the State Railroad Commissioners, have reached an agreement concerning the erection of a new passenger station, and work will probably be begun shortly.

The Canadian Pacific is building a new roundhouse at the foot of John street, Toronto, Ont., to accommodate 15 engines. The cost, including a new turntable, will be about $50,000, and the work is expected to be finished by Oct. 1.

Steam Engine Efficiency.

A committee of the British Institution of Civil Engineers, appointed a year ago or more, have reported the following recommendations on steam engine efficiency, and they have been adopted by the Council:

(1) That the statement of the economy of a steam engine in terms of pounds of feed water per I. H. P. per hour is undesirable.

(2) That for all purposes except those of a scientific nature it is desirable to state the economy of a steam engine in terms of the thermal units required per I. H. P. per hour (or per minute), and that if possible the thermal units required per brake H. P. should also be given.

(3) That for scientific purposes the thermal units that would be required by a perfect steam engine working under the same conditions as the actual engine should also be stated.

The proposed method of statement is applicable to engines using superheated steam as well as to those using saturated steam, and the objection to the use of pounds of feed-water, which contain more or less thermal units according to conditions, is obviated, while there is no more practical difficulty in obtaining the thermal units per I. H. P. per hour than there is in arriving at the pounds of feed-water.

For scientific purposes the difference in the thermal units per I. H. P. required by the perfect steam engine and by the actual engine shows the loss due to imperfections in the actual engine.

A further great advantage of the proposal is that the ambiguous term "efficiency" is not required.

THE SCRAP HEAP.

Notes.

On the South Side Elevated Railroad, Chicago, ticket takers have now been dismissed at all stations. All passengers enter through a turnstile and cash is received for fares on the same basis as tickets.

Brown's discipline has now been in force on the Chicago, Rock Island & Pacific for one year, and the Assistant General Superintendant of the road tells a reporter at Topeka that the officers would not think of going back to the old way. The employees are more carful and painstaking in their work than before.

The New England Telephone & Telegraph Co. has lately put telephones in every room of a new hotel at Boston, Hotel La Touraine. A single battery in the basement, under the control of the operator in the office, is made to serve for all the telephones. The Hotel Brunswick, at Boston, has 240 telephones and the Vendome 70. The Boston & Maine Railroad has 60 telephones in Boston, and a number of business houses have from 20 to 40 each.

The State Railroad Commissioners of South Dakota have re-issued their order requiring reductions of freight rates on the railroads of that state, but the railroads have taken the same action as before, securing a temporary injunction against putting the reductions into effect. A hearing will be had on Sept. 6. Press dispatches state that the reductions ordered by the Commissioners will amount to from 20 to 25 per cent., varying on different roads. The Commissioners have divided the railroads into four classes, the stronger roads being ordered to make reductions of about 25 per cent. and the smaller lines 20 per cent. The passenger rates prescribed are three cents a mile on all standard-gage railroads.

Public Adjustment Association of America.

This is a company being organized in New York with capital of $5,000,000 with the privilege to increase to $10,000,000, for the purpose of reorganizing weak and defaulted properties of railroads and other corporations. The proposed methods include investigation of financial, legal and physical conditions, readjustment by compromise, reorganization or sale and supervision of new bond and other issues. E. W. Evans, 39 Broad street, New York, is Secretary *pro tem.*

Provisional Acceptance of the Dupont.

A preliminary acceptance of the torpedo boat Dupont has been recommended by the Inspection Board, with final acceptance subject to repairs to her condensers. It is estimated that these repairs will cost $5,000, but since the builders, it is said, decline to make them, the Navy Department has ordered another short trial of the boat to be made in order to settle the question of the condenser's efficiency. If it shall be demonstrated by this trial that the condensers are inefficient, they will be overhauled at the New York navy yard at the contractors' expense. The Dupont was built by the Herreshoffs, and on a trial run, recently made, developed an estimated speed of 31.7 knots.

Glasgow Street Railroad Accounts.

Considerable interest and some criticism has been made regarding the accounts of the Glasgow Corporation Tramway Co., the lines of which are entirely under municipal control. Some reports state that the returns to the municipality have been very small, while others have given figures to show the financial benefit to the city as a direct result of municipal management. The *Railway World* takes up the matter and gives figures to prove the roads are not in a "desperate position," as has been represented. The total receipts for the year ending May 31 last were £370,882, which is an increase over the previous year of £36 505. On the other hand, the working expenses amounted to £286,286, an increase of £135,176. The balance was £84,596 compared with £83,267 the previous year. It will thus be seen that the expenses have increased about in proportion to the increase of receipts. In the year ending May, 1896, the total charge for maintenance and renewal of permanent way was £16,332, or .56d per car mile. This amount was totally defrayed out of the revenue. In the last year, however, the charge for this item was fully one penny per car-mile, but only .49d was charged to revenue and the remainder was taken from the permanent way renewal fund. The expense for repairs, renewals, etc., on buildings, rolling stock, horses and equipment was also charged to revenue.

A Hawaiian Railroad.

The sixth report of the Oahu Railway & Land Co., of Hawaii, just received, contains statements for the calendar years 1895 and 1896. The main line of this company is from Honolulu to Waianae, 33.8 miles. Branches and sidings make the total length 38.5 miles. The company also owns wharves, scows and coal elevators at Honolulu and conducts three horse and cattle ranches. The gross receipts from the railroad for 1896 were $119,918, against $90,718 for 1895, while the expenditures were $68,141 for 1896 and $49,263 for 1895. This made the net earnings of the railroad department $51,777 for 1896 against $51,455 for 1895, a gain of $322. During 1895 the length of the road was increased by 15 miles. The receipts from passenger traffic in 1896 were $30,399, of which $3,597 came from commutation and 1,000 mile tickets. There were 9,240 commutation tickets sold during the year. During 1896 all the property of the company was consolidated under one deed of trust providing for the issue of $2,000,000 six per cent. consolidated first mortgage bonds. The proceeds are being used to redeem all present bonded and floating indebtedness, to build a 38-mile extension to Kahuku and to relay 20 miles of track from Honolulu to Ewa Mill with 48-lb. steel rails.

Hospital Car on the Long Island Railroad.

The Long Island Railroad Co has fitted up a car to be used as a hospital in case of accident on the line of the road, and it will be kept at Long Island City. The car is 45 ft. long, and has room for cots for 24 persons. The cots are of such design as to be available for use as stretchers, and are kept in racks at the sides of the car when not in use. At one end of the car a room 12 ft. long is fitted up for the use of the surgeons, the whole of the remainder being one large apartment, with side doors 3 ft. 6 in. wide, like a baggage car, on each side at the middle. The surgeons' room has a large case of drawers and closets, a table and other conveniences.

Battery Park Route Plan Disapproved.

The New York City Park Board has decided not to accept the plan of the Rapid Transit Commissioners for a loop around Battery Park, Bowling Green and Whitehall street, in connection with the proposed extension of the underground road through lower Broadway. The Park Commissioners desired the Rapid Transit Commissioners to modify the submitted plans, so that the top of the tunnel would be 4 ft. instead of 2 ft. below the surface, but the Commissioners stated that they had no power to change the plans, as they had already been approved by the Board of Aldermen.

Lake Notes.

The new steel steamer Empire City, owned in Duluth, has broken the record for lake cargoes on her initial trip. She took out of Two Harbors this week 5,565 gross tons of iron ore, equal to 6,233 tons, besides 150 tons of fuel. She is built entirely of steel, 428 ft. long, 48 ft. beam and 28 ft. depth of hold. This is said to be the first freight ship anywhere, in salt water or fresh, to to be fitted with quadruple expansion engines and water-tube boilers, carrying 250 lbs. of pressure of steam. The boilers are fed by mechanical stokers.

Iron ore sales on Lake Superior this year already amount to 10,000,000 tons.

Shipments from the Chandler mine at Ely, Vermillion Range, will be at least 500,000 tons this year. The company has been obliged to suspend work at the stock-piles of its Soudan mines, the ice being found so hard that the steam shovel could not break it up.

About 1,000 carloads of iron ore are daily received at Ashland over the Chicago & Northwestern and the Wisconsin Central. Last week the two roads put on five new train crews to the mines and shipments are much heavier than they have been since 1892.

Ohio River Improvements.

Plans for the Neville Island locks were sent to Maj. W. H. Heuer, Engineer in Charge of the Ohio River, on Aug. 18. Proposals, it is said, will be invited by Major Heuer for the Neville Island dam, and the work is expected to start within a couple of months. The dam will cost about $700,000.

New York State Canals.

State Superintendent of Public Works Geo. W. Aldridge last week awarded four contracts for canal improvement aggregating $48,028. They are as follows: For rebuilding lock No. 51 of the Black River Canal, to Wilkes D. Dodge, of Boonville, for $15 107; for rebuilding lock No. 55 on the same canal to the same persons for $15,722; for constructing a dam across the Racquette River at Raymondsville, to William Coats, of Raymondsville, for $1,817; for improving the Middle Division of the Oswego Canal, raising the Oswego Falls dam, and other work in connection therewith, to Willard Johnson, of Fulton, for $15,382. The several contracts under the $9,000,000 improvement act for which bids were also opened last week will not be awarded until Superintendent Aldridge can confer with State Engineer Adams.

LOCOMOTIVE BUILDING.

The Missouri Pacific has finished building a new passenger engine at its St. Louis shops.

The Chesapeake & Ohio has placed an order with the Richmond Locomotive Works for 12 consolidation engines.

The Pittsburgh Locomotive Works has received an order to build five freight engines for the Chicago & Eastern Illinois.

The Oregon Short Line has placed an order with Cooke Locomotive & Machine Co., of Dunkirk, N. Y., for two consolidation locomotives.

The Erie Railroad is having an eight-wheel passenger engine rebuilt at the Cooke Locomotive Works and changed to a two-cylinder compound, with a Wootten boiler.

The Baldwin Locomotive Works are building one locomotive for the Rumford Falls & Rangeley Lakes Railroad, and one for the Georgia Pine, a new railroad now being built in Georgia.

Of the 18 heavy locomotives ordered by the Northern Pacific a few weeks ago from the Schenectady Locomotive Works, 12 have already been delivered to the road, and the other six are about finished.

The Imperial Government Railways of Japan has placed orders for the 30 locomotives, referred to in our last issue, 20 to the Brooks Locomotive Works, of Dunkirk, N. Y., and 10 to the Schenectady Locomotive Works, of Schenectady, N. Y.

The Pennsylvania is building at its Juniata shops a consolidation engine with 56-in. drivers and 22 × 28-in. cylinders, and to weigh when finished 96 tons. It is also stated that the Pennsylvania will build four large freight engines at the Altoona shops for the Erie & Ashtabula Division.

CAR BUILDING.

It is reported that the St. Louis, Vandalia & Terre Haute is in the market for 500 cars.

The Ohio Falls Car Mfg. Co., of Jeffersonville, Ind., is building 100 freight cars for the Memphis & Charleston.

The Armour Packing Co. has placed an additional order for 500 cars with the Wells & French Co., of Chicago.

The Louisville & Nashville has placed an order with the Mt. Vernon Car Mfg. Co., of Mt. Vernon, Ill., for 500 box cars.

The Missouri Pacific has placed an order with the Missouri Car & Foundry Co. for 500 more box cars, making 1,000 ordered within the past month.

The Ensign Mfg. Co., of Huntington, W. Va., is building 40 freight cars for the Galveston, Harrisburg & San Antonio (Southern Pacific), and 15 for the Houston & Texas Central.

The Chicago & Northwestern has placed an order with the Haskell & Barker Car Co., of Michigan City, Ind., for 1,000 box cars of 60,000 lbs. capacity. They will be equipped with Westinghouse airbrakes.

The Atlanta, Knoxville & Northern is building 100 flat cars at its own shops. They will be 33 ft. long and 8 ft. wide, with 12-in. side boards, 32 ft. long and no end gates. Buckeye malleable iron M. C. B. drawheads, Westinghouse air-brakes, wooden brakebeams, trussed, and cast-iron oil boxes to take 50,000-lb. journal brasses will be used.

The Harlan & Hollingsworth Co., of Wilmington, Del., has about finished building the 200 gondola cars for the Wilmington & Northern Railroad, referred to in our issue of April 23. They are of 60,000 lbs. capacity and equipped with "Little Delaware" couplers, Westinghouse brakes, Marden brakebeams, Lobdell wheels, and bolsters and draw springs made by the Chas. Scott Spring Co. and the Diamond State Car Spring Co.

The Michigan-Peninsula Car Co., of Michigan City, Ind., has commenced building 500 box cars for the Erie Railroad. We understand that they will be duplicates of the last box cars ordered from that company, with the exception that they will have '97 Fox trucks and pressed steel bolsters. One hundred of the cars will be equipped with Gould couplers, and the remaining with American couplers. Kewaunee brakebeams and steel axles will be used on all the cars.

The Kansas City, Pittsburgh & Gulf last week placed an order for 150 box cars with the Missouri Car & Foundry Co. They will be of 60,000 lbs. capacity and equipped with Westinghouse brakes, Tower couplers, Player trucks, made by the Shickle, Harrison & Howard Iron Co., of St. Louis, and Dunham and Star doors. The company, on Aug. 31, placed another order with the Michigan-Peninsula Car Co., for 200 box cars of the same capacity, to be equipped with Cloud trucks and Tower couplers.

The Brooklyn Heights Electric Railroad has ordered 60 new closed cars with 25-ft. bodies, dividing the order equally among the J. G. Brill Co., of Philadelphia, and the St. Louis Car Co. and Laclede Car Co., of St. Louis. The cars being built by the J. G. Brill Co. will have Brill Maximum Traction trucks, and the other cars will be mounted on Brill trucks, which the railroad company has already bought. The cars will be fitted with Hale & Kilburn seats and Burrowes curtains. Westinghouse "12A" motors and "K 2" controllers will be used.

BRIDGE BUILDING.

Boston, Mass.—The Board of Railroad Commissioners will give a hearing on Sept. 14 on the petition of the Boston Transit Commission for the approval of the building of a bridge over the Fitchburg Railroad in Charlestown at a height less than 18 ft. above the tracks.

Cincinnati, O.—A bridge over Taylor's Creek at Fowler Crossing is contemplated by the Board of County Commissioners; estimated cost, $3,000.

Two estimates of about $3,500 have been submitted to the County Commissioners by County Engineer Krug for a bridge over the Baltimore & Ohio Southwestern on the Montgomery Pike.

Duluth, Minn.—The City Engineer has been instructed by the Board of Public Works to make plans and estimates for two bridges at the West End.

Ford City, Pa.—A bridge across the river at this point is being contemplated.

Hackensack, N. J.—The contract for the new bridge across the Hackensack River at Anderson street has been given to F. R. Long, at $25,000. Other bids were: Dean & Westbrook, $24,900 and $24,950; Youngstown Bridge Co., $22,000; Berlin Iron Bridge Co., $24,200; New Jersey Steel & Iron Co., $23,998; Wrought Iron Bridge Co., $23,558, $24,823, $25,000; King Bridge Co., $23,500.

Havre de Grace, Md.—The Philadelphia, Wilmington & Baltimore will soon begin the building of a new draw in its bridge over the Susquehanna River.

Hogansburg, N. Y.—The War Department has approved plans for a bridge to be built over the St. Lawrence River near here by the Northern New York Railroad. The consent of the Canadian authorities to the bridge has also been obtained.

Louisiana, Mo.—The contract for a new bridge to

replace the Chicago & Alton's over the Mississippi at this place has been given to the Lassig Bridge & Iron Co.

Newark, N. J.—The Essex County Park Commission contemplates a steel and stone bridge at Branch Brook Park.

New Bedford, Mass.—The contract for the middle section of the superstructure of the new bridge between here and Fairhaven has been awarded to the Edge Moor Bridge Works, at $99,338.

New York.—Bids are asked on Sept. 22 by the Commissioners of the New East River Bridge for building the anchorages for the same, as advertised elsewhere in this issue. Specifications and general drawings of the work may be seen at the office of the Chief Engineer, 84 Broadway, Brooklyn.

Riverton, N. J.—It is stated that bids will be asked at once for two new bridges to be built over creeks on the road between this place and Riverside, the Burlington County Board of Freeholders having approved the proposed work.

Shamokin, Pa.—The County Commissioners have accepted the plans and specifications made by the Northern Central for an overhead bridge at the Cameron colliery. They have appointed F. W. V. Lorenz engineer in charge of the work.

Tuscaloosa, Ala.—It is stated that the War Department has approved the plans for a bridge to be built by the Mobile & Ohio Railroad over the Warrior River, near here. It will have a span of 250 ft., and is to be 100 ft. above low water.

Youngstown, O.—The bids received by the County Commissioners for the superstructure of the Market street viaduct ranged from $87,730 to $181,600, that of the Youngstown Bridge Co. being the lowest. The bids submitted were made upon plans furnished by the bidders.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, quarterly, 2 per cent., payable Sept. 30.

Boston & Maine, quarterly, common, 1½ per cent., payable Oct. 1

Delaware & Hudson, quarterly, 1¼ per cent., payable Sept. 15

West Jersey & Sea Shore, semi-annual, common, 2½ per cent., payable Sept. 15.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Ann Arbor, annual, for election of directors and other business, Durand, Mich., Sept. 18.

Lake Erie & Western, annual, Peoria, Ill., Oct. 6.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19-22, 1897.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at p. m.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its seventh annual convention at the Brown Palace Hotel, Denver, Col., beginning Oct. 19, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the third Monday of each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 333.

American Society of Civil Engineers.

A regular meeting of this society was held on Sept. 1, at which a paper by John F. Wallace, M. Am. Soc. C. E., entitled "The Lake Front Improvements of the Illinois Central Railroad in Chicago," was presented for discussion.

Roadmasters' Association of America.

This association will hold its annual convention at Old Point Comfort, Va., Sept. 14 to 16. The Old Dominion Steamship Co. has made a special rate of $10 from New York to Old Point Comfort and return for persons attending the convention, or $5 for one way, both of which include meals and berth.

The Railway Signaling Club.

The club will hold its next meeting in New York City, the place being the Grand Union Hotel, Forty-second street and Fourth avenue, and the date Sept. 14, at 4 o'clock, p. m. There will be a discussion on Mr. Sperry's paper, which was published in the *Railroad Gazette* of March 19, and papers on Battery Tests and Derailing Switches. The last mentioned is by Mr. Charles Hansel, who will discuss the derailer "as a moral and physical agent in safe railway travel." The Lehigh Valley Railroad invites the club to take a trip to Easton, Pa., and back, on a special car, and the Executive Committee has accepted the invitation.

National Association of Certified Public Accountants.

This is the name of an association recently formed in New York City, with a membership of 67. The object of the society is to elevate the accountant's profession, to provide a ready means of intercommunication, and to promote knowledge by lectures and by the dissemination of technical literature. It is hoped to establish an accountants' library. In New York state a law has been recently passed establishing the degree of Certified Public Accountant (C. P. A.), which title is conferred upon suitably qualified persons by the regents of the State University. This legal recognition of the accountant and his work has been received with much favor in New York, and it is hoped to secure similar action in other states. There are a number of railroad accountants in the new association, and Mr. Albert B. Bierck, Acting Auditor of the Long Island road, is First Vice-President. The President is Arthur W. Smith, of New York, and the Secretary, Frederick C. Manvel.

American Society of Railroad Superintendents.

Secretary C. A. Hammond has issued a call for the 27th meeting of this society, which is to be held at the Tulane Hotel, Nashville, Tenn., Sept. 22 and 23. In the forenoon of the first day, besides the election of new members and the routine business, there will be the reports of the Standing Committees on Roadway, on Machinery, on Transportation and on Signaling: and four reports of Sub-Committees, as follows: On Cross Tie Preservation, on Discipline, on Economic Trainload and on Economy in Fuel and Oil for Locomotives. In the afternoon there will be a paper by Mr. A. P. Gest, Superintendent of the Belvidere Division of the Pennsylvania Railroad, on the Relation of the Correct Gage of Wheels to Track. This paper and the four sub-committee reports just mentioned have already been sent out to members, so that there ought to be full and intelligent discussions of the subjects treated. The time allowed, however, seems to be rather brief, the four committee reports being allotted the forenoon only, and the afternoon session being partly taken up by "Reading of other papers" following Mr. Gest's. If, however, the "other papers" should be brief the whole of the afternoon session would be available for discussion of any subjects. The session will be adjourned, however, at 5 o'clock, as the members and their friends are to take a special train at 5:30 over the Nashville, Chattanooga & St. Louis to the Centennial Exposition, where the evening is to be spent.

On the morning of the second day unfinished business will be taken up, and the following list of topics is presented, with a view to making sure that there shall be a sufficient variety to avert any possible dullness:

(*a*) Economical distribution of supplies.
(*b*) Experience with freight air-brakes and uniform couplers.
(*c*) Experiments in electrical traction; the "third rail" system.
(*d*) Relief or benefit associations—pensioning of old employees in cases of long and faithful service.
(*e*) Special telephone service as applied to yard and terminal work, and the handling of suburban trains.
(*f*) Safeguards against "open switch" accidents.
(*g*) Wrecking equipment and operations.
(*h*) The 24-o'clock system of time notation; its advantages and disadvantages in railroad working.

The election of officers and committees will take place at the end of this session and the final adjournment will be at 1 p. m. In the afternoon the members will meet at the Exposition grounds at 2 o'clock, and at 3:20 will go on an excursion from there to the famous Belle Meade stock farm. The annual supper of the society will be given at the Tulane Hotel at 7:30 on Thursday evening. The same night there will be a special train of sleeping cars, by which the members and their friends will go, as the guests of the Nashville, Chattanooga & St. Louis Railroad, to Chattanooga, arriving there at 5 o'clock Friday morning. In the forenoon of Friday it is planned to go to Chickamauga Park, and the afternoon will be spent on Lookout Mountain. The special train will return to Nashville at midnight, arriving the next morning at 6:40. On Saturday members returning home over the Louisville & Nashville can stop off at Mammoth Cave by notifying Secretary Hammond beforehand.

The Committee of Arrangements consists of Ralph Peters, Seely Dunn and M. J. C. Wrenne. They urge all members, with their wives and daughters, to take the trip to Chattanooga. The train will be free and meals at Chattanooga will probably not cost more than 50 cents each.

Rates at the Tulane Hotel, Nashville, are from $1 a day for inside rooms to $2.50 for the best outside rooms with bath. Regular meals 50 cents each.

As usual, the society invites all railroad superintendents to attend, whether members or not.

PERSONAL.

—Mr. J. D. Schultz, Roadmaster of the Rome, Watertown & Ogdensburgh, in Ogdensburgh, N. Y., has resigned.

—Mr. F. E. Guedry has been appointed Division Passenger Agent for the Mobile & Ohio, with headquarters in New Orleans.

—Dr. James Donnelly, of Toledo, has been appointed Chief Surgeon of the Detroit, Toledo & Milwaukee, with headquarters in Toledo.

—Mr. A. I. Wagner, of Salem, Or., has been appointed a member of the Railroad Commission of Oregon, to succeed Mr. H. B. Compson.

—Mr. E. E. Ellis, who was appointed General Agent of the Oregon Short Line, with headquarters at Portland, Or., in June, has resigned.

—Mr. Norman Beckley, General Agent of the Cleveland, Cincinnati, Chicago & St. Louis, at Elkhart, Ind., has resigned to enter into other business.

—Mr. George B. Overbaugh, Assistant General Road Master of the New York Central & Hudson River, died at his home in Schenectady, N. Y., Aug. 31.

—Mr. A. H. Thorpe, Assistant to the General Manager of the Ohio River road, has resigned to accept the position of Auditor of Revenues of the Long Island.

—Mr. Coe Adams, one of the builders of the Frankfort & Kokomo, a part of the Toledo, St Louis & Kansas City in Indiana, died in New York Aug. 26 at 72 years of age.

—Mr. D. M. Denison has been appointed Traveling Freight Agent of the Minneapolis & St. Louis, with headquarters at Minneapolis, Minn., to succeed Mr. W. H. Bend.

—Mr. H. A. Gillis, until recently Master Mechanic of the Norfolk & Western at Roanoke, Va., has been appointed General Superintendent of the Richmond Locomotive Works.

—Mr. W. E. Wicker, Contracting Freight Agent for the Chicago, Milwaukee & St. Paul, with headquarters at San Francisco, died suddenly of heart disease at Reno, Nev., Aug. 27, at 43 years of age.

—Mr. W. P. Shaufele has been appointed Car Accountant of the Wheeling & Lake Erie, with headquarters at Toledo, O., to succeed Mr. J. E. Bratten, who has resigned on account of poor health.

—Mr. D. I. Shontze has resigned the position to which he was recently appointed of Traveling Freight and Passenger Agent of the Omaha, Kansas City & Eastern, with headquarters at Omaha, Neb.

—Mr. Thomas H. Hall, at one time Treasurer of the Westchester & Philadelphia, now a part of the Philadelphia, Wilmington & Baltimore, died at his residence in Swarthmore, Pa., Aug. 25, aged 70 years.

—Mr. Stephen A. Trowbridge, at one time Treasurer of the Peoria, Pekin & Jacksonville, and afterward Paymaster of the Toledo & Ohio Central, died at his residence in Toledo, O., Aug. 23, at the age of 59.

—Mr. Charles Selby, for some time Division Roadmaster of the Rio Grande Western, has had his jurisdiction extended over the entire line, with headquarters at Salt Lake City, to succeed Mr. Thomas Lee, deceased.

—Mr. D. A. Fell, Sr., for several years Master Car Builder for the Lehigh & Susquehanna Division of the Central Railroad of New Jersey, died suddenly at his home in Wilkes-Barre, Pa., Aug. 27, at the age of 80.

—Mr. Frederick Mertsheimer, Master Mechanic of the Kansas Division of the Union Pacific, has resigned to accept the position of Superintendent of Motive Power and Machinery of the Kansas City, Pittsburgh & Gulf.

—Mr. John Jay McDean, Chief Engineer of the Chicago & West Michigan and the Detroit, Grand Rapids & Western, has been elected a member of the Board of Directors of the American Society of Civil Engineers.

—Mr. A. S. Cheever, who has just resigned the position of Chief Engineer of the Fitchburg Railroad, is now Secretary and Treasurer of the Grant Ball Co., of Cleveland, a new corporation formed to manufacture steel balls.

—Mr. Franklin E. Worcester, formerly Treasurer of the Manhattan Elevated, and afterward connected with the Elgin, Joliet & Eastern, died at his home in Brooklyn, N. Y., Aug. 26, at 60 years of age. He was a brother of Mr. E D. Worcester, Secretary of the New York Central & Hudson River, and Vice-President of the Lake Shore & Michigan Southern.

—Mr. W. N. McMahan, retiring Superintendent of the Springfield Division of the Baltimore & Ohio Southwestern, has been presented by the employees of the road with an engraved silver table service of 62 pieces, and his wife with two rocking chairs, as a token of their esteem. Mr. McMahan has been with the company for over 30 years. He resigned recently to enter other business.

—Mr. Erastus Corning, a director for many years of the New York Central & Hudson River, died at his home in Albany, N. Y., Aug. 30, at 70 years of age. Mr. Corning was son of Erastus Corning, the well-known banker, iron manufacturer and railroad man. He was President of the Albany City National Bank, and for many years engaged in the manufacture of iron and steel in the firm of Corning & Co., and afterward the Albany & Rensselaer Iron & Steel Works, in which he amassed great wealth. He became a member of the National Board for the Inspection of Coast Defenses under President Cleveland.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—The headquarters of Assistant General Superintendent William Gibson have been transferred from Baltimore, Md., to Pittsburg, Pa. He is to have full jurisdiction over the Wheeling Division and all its branches.

Fitchburg.—F. O. Melcher, M. Am. Soc. C. E., heretofore Assistant Engineer, has been appointed Chief Engineer in place of A. S. Cheever, resigned.

Illinois Central.—C. A. Florence, General Agent of this company, with headquarters at Boston, has been appointed General Eastern Agent of that company, with headquarters at New York. His successor in Boston is Mr. J. C. Clair, whose title will be New England Agent.

Milwaukee, Benton Harbor & Columbus.—The directors of this company, whose formation by consolidation is noted in another column, are the following: A. A. Patterson, D. H. Patterson, F. M. Steele, F. B. Benton, all of Chicago; F. McOmber, Berrien Springs, Mich.; John A. Patterson, Albany, N. Y., and J. M. Caulfield, South Bend, Ind.

Montpelier & Wells River.—At the annual meeting held in Montpelier, Vt., Aug. 26, the old board of officers and directors was re-elected as follows: President, A. F. Sortwell, Cambridge, Mass.; Vice-President, George E. Carter, Boston; Secretary and Treasurer, Joel Faster, Montpelier; Directors, A. F. Sortwell, George E. Carter, Joel Faster, J. W. Brock and S. C. Shurtleff, Montpelier.

Nashville, Chattanooga & St. Louis.—The office of John L. Edmonson, Southern Passenger Agent, has been transferred from Chattanooga, Tenn., to Nashville.

Santa Fe Pacific.—The office of A. G. Wells, General Superintendent, has been removed from Albuquerque, N. Mex., to Los Angeles, Cal., which is now the permanent headquarters of this company.

Summit Branch Coal Co.—At a meeting of this company, whose reorganization is noted in another column, the following officers were elected: President, Frank Thomson; Secretary, George H. Ross; Treasurer, A. Haviland; Directors, J. P. Green, Isaac J. Wistar, Samuel Rea, N. Parker Shortridge, William D. Winson and Effingham B. Morris

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Alaska Railroads.—C. E. Garthside, of Juneau, Alaska, is surveying the route over the White Pass to the Upper Yukon for the railroad of the British Yukon Mining, Trading & Transportation Co., as described in these columns July 30 It is stated that the highest altitude of the road will be at the summit of White Pass, 2,600 ft., which point is about 20 miles from Skaguay, at the head of Lynn Canal and the beginning of the road.

The line is projected to run to Taku Arm, 68 miles, and eventually to Hootalinqua River, 110 miles.

Arizona Pacific.—This company has been incorporated in Arizona with a capital stock of $10 000,000 to build a road from a point on the Santa Fe & New Mexico east through the counties of Graham, Pinal and Maricopa to Phœnix, Ariz., with branch lines to Clifton and Globe, Ariz.

Atlantic Coast Line.—It has been determined to build an extension of the Wilmington & Conway, a branch of the Atlantic Coast Line, from Elrod, in Robeson County, N. C., southeast to Ashpole, about 11 miles. Officers of the road state that work is to begin at once. Mr. F. Gardner, Chief Engineer of the Atlantic Coast Line, at Wilmington, N. C., has charge of the work.

Big Three.—This company has filed articles of incorporation in Arkansas with capital stock of $3.000,000 for a line to run from Lakeport, on the west bank of the Mississippi River, west through or near Hamburg, New London, El Dorado and Magnolia, to Texarkana, about 200 miles. The directors are D. C. Willett, L. F. Willett and J. B. Bethel, Morganfield, Ky.; D. Clark and L. Franklin, Hot Springs, Ark.

Canaval Coal & Railway.—This company has been incorporated in Nebraska with a capital of $300,000 to mine coal and to build necessary railroad lines. The incorporators are F. A. Dawes, Hugh McCaffrey, T. W. Blackburn and W. R. Dawes.

Colorado Northwestern.—About 500 men are reported to be now at work on this road under Contractors Orman & Crook, of Pueblo, Col. The road is projected to run from Boulder, Col., northeast 26 miles to Ward and Spring Gulch.

Columbia Southern.—The first 10 miles of this road, from Biggs, Or., a point on the Oregon Railway & Navigation Company's line, to Wasco, according to report, will be opened for traffic this week. The company was organized March 4 and grading began June 21 (see this column for July 9). The road is projected to run from Biggs south about 120 miles to Prineville.

Des Arc & Northern.—This company filed a charter in Arkansas, Aug. 27, to take the place of the Higginson & Des Arc, incorporated in January (see this column for Jan. 8), and whose charter was surrendered the same day. The proposed route is from Des Arc, Prairie County, Ark., northwest through Higginson and Stacey to Red River in White County, 25 miles. The capital stock is $50,000, and the central office Des Arc. The directors are: George C. Griffith, George B. Stine, Fred. S. Belcher, Bald Knob, Ark.; G. W. Hunter, H. T. Hunter, St. Louis, Mo.

Duluth, Missabe & Northern.—This company has let a contract to Gulbranson Bros., Duluth, Minn., to build 2.5 miles of railroad from Hibbing, Minn., to the Pillsbury Mine, the agreement being that the work shall be completed within six weeks. The work is heavy and 300 men will be employed.

Elm Valley.—This company was incorporated in Texas Aug. 17 with a capital of $16,000 to build a line from McKinney, Collin County, Tex., about 16 miles, to the west line of the county. The incorporators are F. W. Ford, F. M. Thompson, S. H. Cole, P. E. Dayton, E. W. Kirkpatrick, T. B. Wilson, R. Stiff, R. C. White, L. P. Adamson and I. E. Bates, all of McKinney.

Gulf, Colorado & Santa Fe.—This company is reported to be surveying a line from Wolf City northwest about 10 miles to Bonham, Tex.

Louisiana & Northwestern.—The charter of this company was filed at St. Louis, Mo., Aug. 23, to complete a road from Bienville, La., north to a point on the Arkansas state line. The line from Bienville to Homer, 36 miles, was finished in 1890, by the Louisiana, North & South, and this becomes a part of the new line.

Medford & Southeastern.—This company has been incorporated in Wisconsin with a capital of $200,000 to build a line from Medford, a point on the Wisconsin Central, east 75 miles to Antigo, a point on the Chicago & Northwestern, through the counties of Marithon, Lincoln, Langrade and Taylor. The incorporators and directors are F. M. Perkins, E. L. Urquhart, F. M. Shaw, Peter Doyle and E. H. Schweppe, all of Medford, Wis.

Mississippi River, Hamburg & Western.—Work has begun at Hamburg, Ark., on this road (see this column for June 11), which is projected to extend from Hamburg east to a point on the Mississippi River, about 50 miles. J. M. Parker, Hamburg, Ark., is President.

Missouri & Arkansas Mineral Belt.—This company was incorporated in Arkansas Aug. 27, with a capital stock of $8,000,000, to build a line from Gravett, a town on the Kansas City, Pittsburgh & Gulf, in the northwest county of the state, and extending east through the counties of Benton, Madison, Carroll, Boone and Marion. Directors have been elected as follows: O. L. Cravens, M. W. Clay and D. T. Mason, Neosho, Mo.; George R. Clay, Pineville, Mo; James M. Bobart, Bentonville, Ark.; J. A. C. Blackburn, J. F. Walker, Rogers, Ark.; John A. Bunch, Harrison, Ark., and A. S. Layton, Yellville, Ark.

New York & Ottawa.—The first sod for this new line was turned Aug. 23, near Cornwall, Ont. The sub-contracts have been let on the Canadian side, beginning with Cornwall, as follows: A. R. McLennan, Cornwall, 2 miles; Green & Butler, St. Catharines, 5 miles; P. Bonneville, Lancaster, 2 miles; Charles McGill, Dixon's, 2 miles; T. D. Carroll, Thorold, 10 miles; D. R. McDonald, Williamstown, 10 miles.

Ohio River, Frankfort & Western.—This company, whose incorporation was noted in this column Aug. 13, has engineers in the field making preliminary surveys. The road is projected to run from Dover, Ky., south through Germantown, Mt. Olivet, Cynthiana, Lexington, Nicholasville and Lancaster to Stanford, Ky., about 120 miles. The name is soon to be changed to the Dover, Kentucky & South Atlantic. The officers are: President, William Kinkley; Secretary and General Manager, Albert E. Boone, Zanesville, O.

Omaha, Kansas City & Eastern.—This company is making a survey for an extension from Pattonsburg, Mo., southwest about 75 miles, to St. Joseph, but does not contemplate building the line this year.

Pembroke Southern.—This company has been organized by local capitalists of Pembroke, Ont., and vicinity to build a line from Pembroke, a point on the Canadian Pacific, southwest about 21 miles, to connect with the Canada Atlantic at Golden Lake. Surveys are now being made.

Pittsburgh, Connellsville & Wheeling.—Surveys have been completed for 35 miles of this road from Millsboro, W. Va. The road as projected is to run from Millsboro up Ten Mile Creek via Waynesburg, and down Wheeling Creek to Wheeling, about 50 miles. A. P. Funk, of New York City, is President, and J. R. Romain, of McKeesport, Pa., is Chief Engineer.

Queen Anne's.—The first train from Milton to Queenstown, Md., about 80 miles, was run Aug. 27. The last 10 miles of the road are now under contract to be completed soon.

Salt Lake & Mercur.—This company has asked the County Board of Tooele County, Utah, for a franchise to extend its line down Lewiston Canon northwest to the West Dip. The road now extends from Fairfield to Mercur, 12 miles.

San Francisco & San Joaquin Valley.—Track on this road has been laid for a distance of 15 miles south of Hanford, Cal., and to within three miles of Joaquin Junction, where the Visalia Branch connects with the main line. Grading has been completed 25 miles further south, and surveys have been completed for the entire line to Bakersfield. All the difficulties in the right of way through Kerne County have been settled with the exception of one case, which is to be overcome by condemnation proceedings.

Southern Pacific.—This company is reported to have put at work a large force of men on the short extension in San Pedro Harbor, Cal., to Point Fermin. It will be extended to the beginning of the breakwater.

Southwestern Alabama.—This company, which has been incorporated under the laws of Alabama, is building a road from a point on the Alabama Midland west of the Choctawhatchee River to Elba, Ala., a distance of 35 miles. A contract has been let to W. F. Vandiver, of Montgomery, Ala., who is required to complete the line to Elba by Jan. 31, 1898. About 1,000 men are at work. S. G. M. Sendon, Thomasville, Ga., is President, and Major B. Dunham Chief Engineer.

Springfield, New Albany & South Atlantic.—This company is being organized under the laws of Indiana to build a line from New Albany, Ind., west through Paoli, West Baden, French Lick Springs, Jasper and Petersburg to Vincennes, about 100 miles. Albert E. Boone, Zanesville, O., is Secretary and General Manager.

Tennessee Central.—It is reported that Jere Baxter, President of this company, has closed a contract with the Carnegie Steel Co., of Pittsburgh, for $400,000 for rails and fittings to be used in building this line. The road was bought by him as the representative of a St. Louis syndicate June 24. It is projected to run from the terminus of the Nashville & Knoxville near Monterey, Tenn., east to Knoxville, about 92 miles. Grading has been completed from Monterey to Harriman, about 60 miles.

Union Pacific.—It is reported that engineers have completed a survey for shortening the main line of this road between Cooper Lake and Medicine Bow, Wyo., a distance of 45 miles. There are a number of heavy grades and curves in this section which would be reduced by the proposed new line and the distance would be shortened by about 15 miles.

Van Zandt Central.—This company, which was incorporated in Texas June 30 (see this column for July 9), is making surveys for the proposed road to run from Canton Junction, Tex., north 14 miles to Wills Point, where it will connect with the Texas & Pacific. It is expected that contracts will be let soon for the grading. D. D. Thames, of Canton, is President and J. M. Preston, of Dallas, Tex., is Engineer in charge.

Wheeling & Lake Erie.—Some changes have been made in the line of the proposed extension of this road from Martin's Ferry, O., opposite Wheeling, W. Va., to Bellaire. It has been decided to cross to Wheeling Island below Bridgeport, which will require two bridges over the Black River, but will cost less for the right of way.

Electric Railroad Construction.

Akron, O.—Contracts have been let for the grading of the new Cleveland-Akron Electric Railroad.

Beaver Falls, Pa.—Funkhouser & Coates has been given the contract for building the Riverview Electric Railroad at Beaver Falls, Pa. The amount is said to be $30,000.

Bridgewater, Me.—Work on the Bridgewater, Whitman & Rockland Street Railroad is being rapidly pushed and the contractors, Messrs. J. F. Shaw & Co., expect to have the entire line completed by the end of the month.

Chicopee, Mass.— On Aug. 23 the City Council granted a franchise for the Holyoke Street Railway Co. to extend its line on Chicopee street.

Coxsackie, N. Y.—The State Railroad Commissioners last week inspected the route of the proposed road of the Greene County Traction Co., in Greene County. Nothing definite has been done, so far as we can learn, in regard to completing plans for the road.

Dedham, Mass.—The Selectmen of Dedham have voted to grant the West Roxbury & Roslindale Street Railway Co. a location from the Boston line along Bussey street to Tracy's square, East Dedham.

Denver, Col.—The County Commissioners have granted a franchise to the Loretto Heights Railway Co. to build electric roads in Denver. The franchise requires the company to grade the roads over which the line will run, and also to keep them in repair as long as the life of the franchise lasts.

Gloversville, N. Y.—The Mountain Lake Electric Railroad Co. has applied for a franchise to build its road on certain streets in Gloversville.

Greenbush, N. Y.—The Greenbush & Nassau electric road, which has frequently been referred to among our notes, will probably not be built this year.

Haverhill, Mass.—The Haverhill & Salem Electric Railroad Co. has been organized, with a capital stock of $60,000 and the following temporary directors: W. B. Ferguson, of Malden; Frank E. Lowe, of Greenfield; C. E. Barnes, of Plymouth; T. C. White, of Methuen, Dr. W. P. Robinson, Charles Burnham and E. B. Fuller, of Haverhill, the latter being elected clerk and treasurer. The company will seek incorporation in Massachusetts and New Hampshire, and will ask a location from Haverhill to Salem Depot and Canobie Lake, N. H.

Kansas, Mo.—The Kansas City & Eastern Railway Co. has been incorporated with a capital stock of $50,090, to build an electric road from the end of the Westport cable line to Leeds. Among the incorporators are B. F. Robinson and John Hoffman, of Kansas City, and Henry Pfeiffer, Westport, Mo.

Leavenworth, Kan.—The Leavenworth & Lansing Electric Railway Co. has been incorporated with a capital stock of $150,000, to build an electric road between the cities mentioned in the title. The directors include C. B. Leavel, W. E. Winner, Kansas City, Mo.; and E. B. Merritt, Lansing, Kan.

Little Falls, N. Y.—The Little Falls & Harkimer Railroad Co. has applied for a franchise to build an electric road through certain streets in Little Falls. A committee of five has been appointed to prepare and submit plans and a franchise at the next meeting.

McKeesport, Pa.—The McKeesport, Duquesne & Wilmerding Street Railway Co. has been purchased at a Receiver's sale by Horace G. Crosby for $175,000.

Monterey, Va.—The question of extending the Staunton Street Car Company's lines to Monterey will be submitted to the people of Staunton at an early date for the purpose of voting on an appropriation of $25,000 for this purpose.

Montoursville, Pa.—A contract for the construction of the power-house of the Montoursville Electric Railway has been given to G. Waltz and the contract for the stone for the foundation to J. N. Blackwell.

Muscatine, Ia.—The Muscatine, North & South Railway Co. has petitioned the council for an extension of the franchise from Aug. 20, 1897, to Nov. 1.

New York.—The electric conduits for the Fourth & Madison Avenue Line of the Metropolitan Traction Co., have been placed along the route from Fifty-ninth street to Forty-second street. Work will be pushed on the tunnel below Forty-second street, and it is expected that this part of the line will be completed in 15 days.

Olean, N. Y.—The Olean Terminal Railway Co. was incorporated on Aug. 19, with a capital stock of $25,000, to build an electric road in Olean about 1¼ miles in length. The directors include F. N. Love, Greenfield, Mass., and William L. Frazee and George Van Campen, of Olean.

Pekin, Ill.—The Peoria & Pekin Traction Co. has been incorporated to build an electric road from Pekin to Peoria a distance of about 10 miles. It will be necessary to secure permission to build a bridge across the Illinois River at Pekin.

Pensacola, Fla.—The Pensacola Electric & Terminal Co., which recently applied for a charter, proposes to change the entire street car line so as to be worked by electricity. It is also proposed to build 5 miles of additional track.

St. Paul, Minn.—An ordinance has been introduced into the City Council providing for changing the cable line on Selby avenue into an electric line. The estimated cost is $91,000.

Syracuse, N. Y.—Work was begun on the 19th inst., on the Suburban Railroad at Manlius. Mr. C. E. Hubbell, one of the promoters of the road, states that the line will be completed by Dec. 1 providing the weather permits of continuous work.

Tampa, Fla.—The Fort Brooke Council has granted a permit to build an electric road through the streets of Tampa to Colonel F. A. Salmonson and associates.

Walpole, Mass.—The selectmen of Walpole have granted a franchise giving the Norfolk Southern Street Railway Co. the location asked for through the town. The new road is to begin at Norwood, and extend through Walpole and Foxboro to Mansfield. Walpole is the first town to sign the franchise, and it is understood that the other towns will take favorable action. The road will make a through connection between Boston and Providence and also between Falls River and New Bedford, where other connecting lines are now being built.

Westwood, Mass.—A public hearing has been given by the selectmen of Westwood for a petition of the directors of the Norfolk West Street Railway Co. asking for a location in that town. After careful consideration by many interested in the project the selectmen took the entire subject under advisement.

Wheeling, W. Va.—Mr. L. G. Hallock, of Wheeling, has the contract for the entire work of the electric road building which is now in progress in the city limits. The entire length of nearly 2½ miles will be of first-class construction, with steel poles and 90-lb. 60-ft. girder rails.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—Judge Foster, of the United States Circuit Court at Topeka, Kan., on Aug. 23 ordered the sale of the lands, accounts and old materials and other property of this company not included in the sale made under the original foreclosure proceedings on Dec. 10, 1895. The lands are to be sold at Cimarron, Kan., and the property at Topeka, the date of the sale to be determined by the receivers. This is considered the final step in settling the affairs of the receivership.

Canadian Pacific.—The earnings for July and for the seven months ended July 31 were reported as follows:

	1897.	1896.	Inc. or Dec.	
July:				
Gross earn.....	$2,107,002	$1,803,575	I.	$303,423
Oper. expen.....	1,192,613	1,104 340	I.	88,307
Net earn.....	$914.359	$699,235	I.	$215,124
Seven Months:				
Gross earn.....	$11,819,696	$11,955,228	D.	$135,532
Oper. expen.....	7,235,144	8,147,056	D.	911 912
Net earn.....	$4,584,552	$3,808,172	I.	$776,380

Central Pacific.—This company has made arrangements to extend its $25,883,000 first mortgage bonds, which mature Jan. 1, 1898, so that the principal shall fall due as follows: $2,995,000 on Dec. 1, 1898; $3,383,000 on Dec. 1, 1899; $3,997,000 on June 1, 1900, and $15,508,000 on June 1, 1901, with interest at five per cent. per annum. The right is reserved to redeem the bonds at any time by paying par and interest at six per cent. from Jan. 1, 1898. To avail themselves of the extension, bondholders must present their bids at the office of Speyer & Co., New York, on or before Oct. 30, 1897.

Chicago & Atchison Bridge.—Suits of foreclosure have been brought by the mortgage trustees. This company owns a toll bridge and railroad across the Missouri River at Atchison, Kan., used by the Chicago, Rock Island & Pacific, the Hannibal & St. Joseph, the Kansas City & Council Bluffs, the Missouri Pacific and the Atchison, Topeka & Santa Fe. The reorganization is in charge of a committee of which George S. Morison is Chairman, and H. P. Eells, Cleveland, O., is Secretary. The committee's plan, issued May 6, provides for fore-

closure of the mortgages and turning over the property to a new company which shall issue not to exceed $700,000 in new common stock and $665,000 in first mortgage 30-year four per cent. gold bonds dated Jan. 1, 1898. There are outstanding $142,750 of second mortgage seven per cent. bonds which matured in 1895 and which are to be exchanged for an equal amount of new first mortgage bonds and three per cent. in cash. There are outstanding $782,000 in consolidated mortgage bonds which are to be exchanged for 66⅔ per cent. of the face value in new first mortgage bonds and 85 per cent. of new stock.

Chicago & Northwestern.—Circular letters have been sent to all stockholders asking for proxies on a proposition to purchase the Chicago, St. Paul, Minneapolis & Omaha, which is to be voted on at the next annual meeting. This road is practically a part of the Chicago & Northwestern already, though it still retains its separate organization.

Chicago Junction Railway & Union Stock Yards Co.—At a recent meeting of the directors it was voted, according to press reports, to obtain control of the Chicago, Hammond & Western through the purchase of a majority of the $1,500,000 capital stock of the company. The Chicago, Hammond & Western is a belt line running from Hammond, Ind., to La Grange, Ill., 35.2 miles, and reaches the Union stock yards over the tracks of the Chicago Terminal Transfer. The Chicago Junction Railway & Union Stock Yards Co. was incorporated under the laws of New Jersey in 1890. It owns the Union stock yards and 245 miles of railroad and sidings which connect with all the railroads entering Chicago. On Jan. 4 the stockholders authorized an issue of $2,500,000 bonds to be used in acquiring new lines.

Chicago, Milwaukee & St. Paul.—The earnings for July were reported as follows:

July:	1897.	1896.	Inc.
Miles oper.	1,648	1,648	.....
Gross earn.	$2,713,393	$2,546,226	$167,167
Oper. expen.	1,763,555	1,725,363	38,192
Net earn.	$949,838	$820,863	$128,975

Colorado & Northwestern.—A mortgage for $500,000 to the Mercantile Trust Co., of New York, was filed at Boulder, Col., by this company Aug. 24, to secure bonds which are being used to build its line from Boulder to Ward and Spring Gulch, Col.

Erie.—The earnings for July were as follows:

July:	1897.	1896.	Inc.
Gross earn.	$2,850,894	$2,635,533	$215,361
Oper. expen.	2,052,709	1,853,078	199,631
Net earn.	$798,185	$782,455	$15,730

Under operating expenses is included one-twelfth of the entire taxes for the year.

Lake Shore & Michigan Southern.—The earnings for the quarter ended June 30 were reported as follows:

	1897.	1896.	Inc. or Dec.
Gross earn.	$4,878,672	$5,079,019	D. $200,347
Oper. expen.	3,120,255	3,416,724	D. 296,469
Net earn.	$1,758,417	$1,662,295	I. $96,122
Other income	17,717	121,627	D. 103,910
Total	$1,776,134	$1,783,922	D. $7,788
Fixed charges	1,052,717	1,126 627	D. 73,910
Surplus	$723,417	$657,295	I. $66,122

Lebanon Springs.—Justice Edwards issued an order at Hudson, N. Y., August 26, giving this company power to sue the bondsmen of the late W. V. V. Reynolds, Receiver of the road. The application alleges that Mr. Reynolds drew out more than $24,000 of the company's earnings prior to his death in January.

Lehigh Valley.—The earnings of this company for July and for the eight months ending July were reported as follows:

July:	1897.	1896.	Inc. or Dec.
Gross earn.	$1,607,170	$1,728,037	D. $120,867
Oper. expen.	1,158,355	1,290,121	D. 131,766
Net earn.	$448,815	$437,916	I. $10,899
Eight months:			
Gross earn.	$11,301,032	$11,805,220	D. $504,188
Oper. expen.	9,100,918	9,651,783	D. 550,865
Net earn.	$2,200,114	$2,153,437	I. $46,677

Louisville, Evansville & St. Louis.—The Court has authorized the Receiver to issue $100,000 receivers' certificates for the purpose of equipping freight cars with automatic couplers and air-brakes, and work will be done as fast as possible.

Millen & Southern.—This road is advertised to be sold Oct. 5, under foreclosure of the mortgage of 1892. The Citizens' Bank of Savannah, Ga., is the mortgage trustee. The road extends from Millen, a point on the Central of Georgia, to Stillmore, Ga., 36 miles. It was chartered March 26, 1890, as successor to the Rogers & Summit.

Milwaukee, Benton Harbor & Columbus.—The articles of agreement for the consolidation of the St. Joseph Valley and the Benton Harbor & Southeastern into the above company were filed with the Indiana Secretary of State Aug. 23. The capital stock is $600,000. The St. Joseph Valley Company receives 3,000 shares and the Benton Harbor & Southeastern 120 shares in the consolidated company. The rest of the stock is to be used for an extension of the line, which is now being built. The directors of the consolidated company are given in another column.

Montgomery, Hayneville & Camden.—This company is filing a mortgage for $1,500,000 issued to complete its line which is projected to run from Montgomery, Ala., southwest to the Gulf of Mexico (see these columns for April 30). The amount of bonds authorized is $12,500 per mile, the bonds running 30 years at five per cent.

Norwich & Worcester.—The new $280,000 four per cent. 20-year bonds authorized some weeks ago have been sold at 106.19 to Kinnicutt & De Witt, Worcester, Mass., and Kidder, Peabody & Co., R. L. Day & Co. and Estabrook & Co., Boston.

Pennsylvania.—This company has issued $5,000,000 guaranteed 3½ per cent. gold trust certificates secured by $5,000,000 of guaranteed special stock of the Pittsburgh, Ft. Wayne & Chicago, which forms the company's main line from Pittsburgh to Chicago. This loan has the special guarantee of the Pennsylvania Co. and is to be known as "Series A." It is issued in amounts of $1,000, payable 40 years from Sept. 1, 1897, with interest payable March 1 and Sept. 1 each year. As a sinking fund the agreement provides that $50,000 shall be applied by the Pennsylvania Co., on Sept. 1, each year to the purchase of such certificates as may be offered for redemption in response to advertisements, at par and accrued interest. It is understood that the proceeds will be used to take up the $2,600,000 second mortage seven per cent. bonds of the St. Louis, Vandalia & Terre Haute which fall due May 1, 1898, and the $2,109,000 consolidated mortgage seven per cent. bonds of the Erie & Pittsburgh, which fall due July 1, 1898. Both roads are owned by the Pennsylvania Co. The loan has been taken (at par, according to report) by the following institutions: Girard Trust, Philadelphia National Bank, Bank of North America, Girard National Bank, the Chemical National Bank of New York, Union Trust Company of New York, and Harvey Fisk & Sons. Of this loan $3,500,000 is offered to the public at 103 and interest from Sept. 1, 1897.

Philadelphia & Reading.—The earnings of this company, including the Railway Co., the Coal & Iron Co. and the Reading Co., for July were as follows:

July:	1897.	1896.	Inc. or Dec.
RAILWAY CO.			
Gross earn.	$1,916,595	$1,752,813	I. $163,782
Oper. expen.	1,067,220	1,009,439	I. 57,781
Net earn.	$849,375	743,374	I. $106,001
COAL & IRON CO.			
Gross earn.	$2,075,758	$2,028,205	I. $47,553
Expen.	1,915,314	1,961,429	D. 46,115
Net earn.	$160,444	$66,776	I. $93,668
READING CO.			
Net earn.	$31,362	$31,362	.....
ALL THE COMPANIES.			
Net earn.	$1,041,181	$841,512	I. $199,669
Fixed charges*	745,000	840,000	D. 95,000
Surplus	$296,181	$1,512	I. $294,669

*Estimated.

St. Louis, Peoria & Northern.—Recently Dwight L. Wing, of Springfield, Ill., complained before the Illinois Railroad Commissioners that this company was proceeding illegally in building the new line of road from Springfield north to Peoria (see these columns for Aug. 27). The grounds of the complaint are that the company has never completed its incorporation, has issued bonds on a mortgage covering both railroad and mining property, has not filed a copy of its by-laws with the Secretary of State, and is conducting both a railroad and coal mining business under the same charter. The company denies the charges. The Attorney-General decides that the Commission has full powers to decide the case, and Sept. 7 has been set for the hearing.

Southern.—The earnings for July were as follows:

July:	1897.	1896.	Inc.
Mileage	4,895 1	4,754.5	50 6
Gross earn.	$1 483,564	$1,423,675	$59,889
Expen. and taxes	1,167,480	1,095,799	11,681
Net earn.	$376,084	$327,876	$48,208

Summit Branch Coal Co.—At a meeting for the reorganization of the Summit Branch Railroad Co., in Philadelphia, this new company was organized for the purpose of taking over the property of the old company. The property was bought at auction July 16 for $50,000 by Effingham B. Morris for the bondholders. The assessment of $9 per share under the reorganization is payable $3 Sept. 15, $3 Oct. 15 and $3 Nov. 15.

Wabash.—The earnings for July were reported as follows:

July:	1897.	1896.	Inc. or Dec.
Miles oper.	1,935	1,935	.....
Gross earn.	$970.635	$1,045,499	D. $71,864
Oper. expen.	641,202	730,185	D. 88.983
Net earn.	$329,433	$315,314	I. $14,119

Wilmington & Newbern.—A mortgage for $500,000 to the Safe Deposit & Trust Co., of Baltimore, Md., was filed by this company at Wilmington, N. C., Aug. 25, on its railroad and other property. This company purchased the Wilmington, Newbern & Norfolk on July 15 for $400,000 (see this column for July 23). It is understood that the road is to be operated as part of the Atlantic Coast line.

Electric Railroad News.

Atlanta, Ga.—It is stated that the receiver of the Atlanta Electric Railway Co. will be dismissed, and the control of the road will go to the stockholders. Mr. J. F. Leary, creditor, holds a mortgage covering the entire property, the mortgage being originally held by Mr. D. H. Livermore, who advanced the sum of $30,000 which was used in the construction of the road. Of this amount Mr. Leary contributed $10,000 which, it appears, was secured by the $30,000 mortgage on the entire property.

Butte, Mont.—John R. Wharton, Superintendent of the Butte Consolidated Railway Co., has been appointed Receiver of that company.

Lewiston, Me.—A larger part of the stock of the Lewiston & Auburn Horse Railroad, which is now being operated by electricity, has been sold to a syndicate composed of A. F. Gerald, of Fairfield; Hon. I. C. Libby, Waterville; G. C. Moses and Hon. F. H. Twitchell, of Bath. Sometime since the syndicate bought $152,000 of second mortgage bonds and later $25,000 of the second mortgage bonds which were held by the Framingham, Mass., bank, and on the 26th of last month they concluded the deal for $34,500, which gave them control of the road. A. F. Gerald has been elected General Manager. It is proposed to issue $750,000 worth of bonds for building a through electric road from Lewiston to Bath through Brunswick.

Lincoln, Neb.—The plan for the reorganization of the Lincoln Street Railway Co., of Lincoln, Neb., provides for the formation of a new company with an authorized capital stock of $700,000 of preferred stock and 3,650 shares of common stock at $100 a share. Bonds amounting to $100,000 secured by first mortgage on all property and franchise are to be issued.

Louisville, Ky.—The stockholders of the Incline Plain Electric Railroad Co. have decided not to accept the offer made by the Consolidated Railroad for purchasing the former line for $400,000. The majority of the stockholders have decided, however, to sell the road if a fair price can be secured.

Oakland, Cal.—On Aug. 15 the Oakland Realty Syndicate secured control of the East Oakland Street Railroad Co. at foreclosure sale. The price paid was $60,500, which amount will permit the outstanding claims to be paid in full, but is considerably below the estimated value of the road.

St. George (S. I.), N. Y.—The commissioners appointed by the Appellate Division of the Supreme Court to report whether or not it was necessary for the Staten Island-Midland Electric Railroad Co. to lay its tracks through South street in order to make connections with the station at St. George ferryhouse, has filed its report in favor of the Midland Company. The Rapid Transit Railroad Co. has opposed the use of South street for the Midland road, thus preventing the latter company from making connections with the boats to and from New York.

TRAFFIC.

Traffic Notes.

The Baltimore & Ohio, which has long carried bicycles in baggage cars without charge, but at owner's risk, now announces that wheels will be checked, the same as baggage.

The Illinois Central announces an advance in the export corn rate to New Orleans of five cents, the rate from points in Illinois) being raised from 10 cents per 100 lbs. to 15 cents on Sept. 6.

The fruit raisers of Oregon are competing with those of California, and the Great Northern Railway, in connection with the Oregon Railway & Navigation Co., is running a fast daily fruit train to Chicago.

The Attorney-General of Texas filed 15 suits against three railroads at Austin last week, alleging secret discrimination in rates on cotton carried to Houston last year. One press dispatch notes the "singular coincidence" that suits of this kind are generally begun about the time that the political campaign opens.

E. C. Spalding, of Atlanta, Ga., general manager of a combination of car companies which operates 12,000 freight cars, says that the present demand for cars is greater and more active than it has been for the last five years, and is increasing daily. Mr. Spalding could lease to advantage 12,000 additional cars, if he had them, without any trouble.

A reporter at Indianapolis learns that railroad officers in that region are trying to agitate a reform of the free pass evil in connection with excursions. It is stated that on the occasion of the Grand Army Encampment at Buffalo last month two passes were issued for every 10 passengers. This, presumably is a rough guess. It is stated that 45 free tickets were issued at Indianapolis alone. It is claimed that 285 free tickets were issued by the railroads to a religious convention held in Indianapolis a week or two ago.

Interstate Commerce Commission.

The Interstate Commerce Commission in an opinion by Commissioner Knapp has announced its decision in the case of the New York, New Haven & Hartford against the Receivers of the New York & New England. The question involved was the right of one carrier to issue a so-called joint tariff between it and its connecting carriers without the consent or concurrence of said carriers. The New England published a schedule purporting to be a joint tariff of rates on coal from a point on its road to a number of destinations reached by the New Haven whereby the New Haven received its full local charges, and the New England accepted the remainder, which was in each instance less than its established local rate to the point of connection. Complainant (the New Haven), which also carried coal to the same destinations by a longer route over its own rails, refused to unite in the rates named by defendant in the so-called joint tariff, and protested against the use of such rates by a connecting carrier as unauthorized and unlawful for want of mutual consent.

It was held by the Commission that the complaint should be sustained and the defendant be required to cease and desist from publishing or applying through rates to points on complainant's lines which are less than the sums of their respective local charges.

Chicago Traffic Matters.

CHICAGO, Sept. 1, 1897.

The grain movement continues heavy, receipts last week being 11,446,000 bu., a considerable increase over the previous week and more than double the receipts for the same period of the three previous years. In the 48 hours ending Sunday night 5,065 cars of grain were received in Chicago. The shipments by lake are the heaviest in the history of the trade and rates have been from 1¼ to 1¾ cents a bushel to Buffalo for some time, and 1⅞ cents and 2 cents are now reported in some cases. The Burlington people, although leading the list as corn carriers, claim to be furnishing substantially all the cars asked for by the Nebraska shippers.

The lines between Chicago and St. Paul are still having great difficulty in dealing with their passenger traffic, rates having been demoralized for a long time. A meeting was held last week, but the three lines which stand out, the Wisconsin Central, the Chicago Great Western and the Minneaplis & St. Louis, are as intractable as ever. These weaker lines are getting about all the theatrical and excursion business. The traffic men have referred the difficulty to the presidents.

The passenger men west of Chicago are nervous over the action of the Rock Island in making a round trip rate of $62.50 to San Francisco. This was made ostensibly for the national convention of letter carriers. The letter carriers concluded not to go to California, but the rate is still in effect.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending Aug. 26 amounted to 66,511 tons, as compared with 61,281 tons the preceding week. This statement includes 30,488 tons of grain, 2,510 tons of flour and 11,351 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Aug. 26.		Week Ending Aug. 19.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	1,718	2 6	1,714	2.8
C., C., C. & St. Louis	4,025	6.0	3,004	4.9
Erie	7,623	11.4	7,614	12.4
Grand Trunk	8,827	13.3	7,829	12.8
L. S. & M. S.	6,537	9.8	8,008	13.1
Michigan Central	17,745	26 7	17,624	28.8
N. Y., Chi. & St. L.	2,836	4.3	2,080	3.4
Pitts., Cin., Chi. & St. Louis	4,052	6 1	4,062	6 6
Pitts., Ft. Wayne & Chicago	8,443	12.7	5,668	9.2
Wabash	4,705	7.1	3,678	6.0
Totals	66,511	100.0	61,281	100.0

Lake shipments last week were 199,138 tons.